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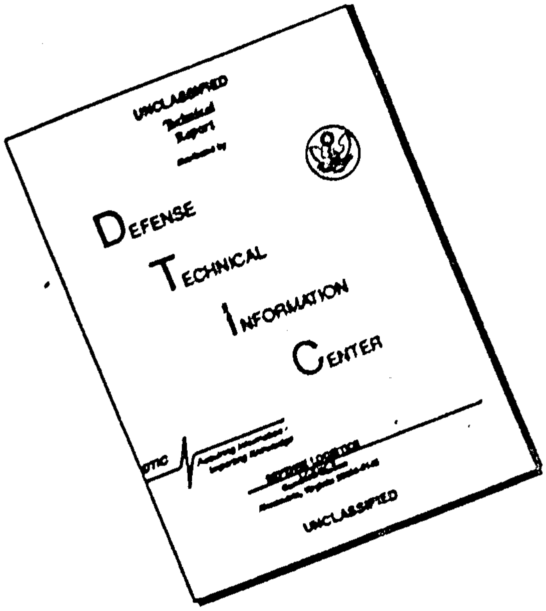

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NAVIES IN WAR AND IN PEACE

by Hero of the Soviet Union,
Admiral of the Fleet of the Soviet Union
S. G. Gorshkov.

THE SECOND WORLD WAR

Preparation for War. After the division of the world into two systems as a result of the October Revolution in Russia, the policy of the imperialist powers to a considerable degree was determined by their constant desire to destroy the Soviet Union. Therefore, the USA, Great Britain, and France, intending to use Germany as a weapon to implement their plans, aided her with liberal subsidies to recover from the consequences of the military damage of the First World War in a short time, to rapidly restore her military and economic potential, and to revitalize her powerful armed forces. The imperialists were fully confident that the military might of Germany would be directed against the USSR. Moreover, weakened by the war, Germany seemed incapable of opposing the main imperialist groups. [14*

International monopolistic capital aided the German Fascists to come to power in order to implement this concept. Hitler's government threw out the restrictions of the Versailles Treaty which prohibited the armament of Germany and returned to preparations for war: it reorganized industry, put the development of the entire economy on the military track, and began a corresponding ideological manipulation of wide circles of the German people. In 1935 the Anglo-German Naval agreement was concluded. It abolished the restrictions of the article of the Versailles Treaty on naval armaments and freed the hands of Hitler Germany to build a powerful navy. By the end of 1939, the German Army and Air Force surpassed the armies and air forces of any of the capitalist countries. Having such armed forces, Germany, in Hitler's opinion, was able to establish a hegemony in Europe. However, it was not the final goal of the aspirations of Hitler Germany, but was considered only a prerequisite for gaining further world supremacy which, according to the concept of the Fascist ringleaders, would be achieved in two stages: first, the establishment of supremacy in Europe and the destruction of the Soviet Union, and secondly, the seizure of the overseas colonial possessions of the European states.

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* Numbers in right margin indicate original pagination.

This policy predetermined the special attention given by the leaders of Hitler Germany to the creation of primarily ground and air forces. However, since the achievement of world supremacy was connected with the seizure of overseas colonies, Fascist Germany also considered it essential to create a powerful fleet capable of ensuring the achievement of her set aims. According to "Plan Z" worked out as early as 1938 and scheduled [to last] nine to ten years, Germany's Navy by 1948 was supposed to have in its inventory 13 battleships, four aircraft carriers, 3? cruisers, 267 submarines, and a large number of destroyers and other combatants.*

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* Belli, V. A., V. P. Bogolepov, L. M. Yeremeyev, Ye. N. Lebedev, B. A. Pochikovskiy, and A. P. Shergin. Blokada i kontrblokada. Bor'ba na okeanskikhk soobshcheniyakh vo vtoroy mirovoy voyne. (Blockade and Counterblockade. The Struggle for Ocean Communications in the Second World War). Izd-vo Nauka, 1967, p. 81.

The failure of the 1936 London Conference, which tried to find ways of further regulating naval armaments, served as a signal for an unlimited arms race by the imperialist powers. Just the very fact of repeated attempts to regulate naval armaments by international agreements, especially after the First World War, attests to the important significance the major imperialist countries attached to naval forces.

Yet despite this, by the outbreak of war, the German Navy was not as powerful as the navies of England and France, although this was somewhat compensated for by the presence of Germany's allies in the aggression--Fascist Italy in Europe and Japan in the Pacific Ocean had vast fleets at their disposal (Table 1). However the trend in the development of the navies due to the conceptions of their employment adopted by their leaders were significantly different.

The cutting off of the enemy's shipping by attacking his merchantmen and combatants with all existing forces was considered the chief mission of the German Navy.

The British plan for naval warfare operations was based on the fact that the conditions for the employment of the Navy would not be essentially different from the situation in which it operated in the First World War and called for a long-range naval blockade of Germany and the protection on her own sea communications. The military geographical situation made it easier for the British to organize a naval blockade of Germany, although under the conditions which were arising, it already could not be as effective a means as in WW I.

Table 1.

Composition of the Navies of the Main Imperialist Countries at the Outbreak of WW II.

Ship types	England	France	U.S.A.	Total	Germany	Italy	Japan	Total	Relative strength
Battleships and battle cruisers	15	7	15	37	2	4	10	16	2.3:1
Aircraft carriers & aircraft transp.	8	2	6	16	--	--	10	10	1.6:1
Cruisers (heavy, light, & air def.)	66	19	37	122	11	22	35	68	1.8:1
Destroyers	119	70	181	370	42	128	111	281	1.3:1
Submarines	69	77	99	245	57	115	63	235	1.0[illegible]

Data on Japanese Fleet of 1 December 1941.
Table compiled from book by L. M. Yeremeyev and A. P. Shergin "Submarines of foreign navies in WW II, Voyenizdat, 1962, pp. 21, 227, 273, 285, 375.

The French Navy and part of the forces of the British Navy supported by a developed systems of bases were supposed to ensure supremacy in the Mediterranean Sea.

Thus, the naval doctrines of both the opposing coalitions were oriented toward achieving decisive goals by active methods of employing their own naval forces, but the doctrines differed in content. Thus, whereas the German command intended to distribute their naval operations practically throughout the entire Atlantic Ocean, the English and French commands strove to concentrate their main efforts in comparatively limited areas of the seas contiguous to German territory. The concentration of larger forces in limited areas of the theater in direct proximity to the system of bases of the German Fascist Navy stood in contrast to the dispersal of the efforts of a fleet with a smaller strength over vast ocean expanses.

The Role of Navies in the Second World War and Their Effect on the Course and Outcome of the War. The Second World War began as an imperialist war for the division of the world which Germany, Japan, and Italy demanded.

After Hitler Germany seized Austria, Poland, and Czechoslovakia, [16
the ruling circles of England and France still hoped to direct the Fascist aggression against the Soviet Union and for a long time they essentially conducted no military operations on the ground fronts. Hitler and the Wehrmacht generals, considering the defeat of the neighboring bourgeois states and the establishment of supremacy in Western Europe to be a necessary prerequisite for an attack on the USSR, were able to concentrate troops on their borders under quiet conditions. In this period military operations were conducted only in the naval theater.

In order to protect its tranoceanic shipping and consequently to oppose the naval forces of Fascist Germany, the British Fleet had to disperse its forces throughout the entire Atlantic theater which produced great difficulties in the employment of the insufficient number of antisubmarine, antimine, and convoy ships and did not yield the desired effect. As a result, in the first ten months of the war the Germans destroyed 701 merchant ships of Great Britain and her allies with a total tonnage of more than 2,335,000 GRT, of which 300 ships with a total tonnage of 1,137,000 GRT were sunk by submarines.* The

* Ibid, pp. 146-147.

total tonnage of ships sunk per submarine in the inventory of the German Fleet reached 22,000 tons, while in 1918 it was only about 15,000 tons. As is evident, the effectiveness of the operations of the German submarine forces was higher than in the last ten months of the First World War. However, in that period the Germany lost 23 submarines (i.e., 40% of all the submarines which she had at the outbreak of the war) which attests to the rather intense warfare at sea.

At the same time major German combatants were operating with the submarines against England's sea communications: two "pocket" battleships and five auxiliary cruiser raiders. In addition, German cruisers, destroyers, and surface minelayers made nine cruises to the shores of England where 1700 mines were planted by the beginning of February 1940.*

* Ibid, p. 130.

In addition to merchant ships, as a result of enemy attacks, England lost a battleship and an aircraft carrier, while two battlehips, two cruisers, ten destroyers, an air defense ship, and two submarines were put out of action.*

* Ibid, p. 149.

earlier plans for naval development) in order to permit them to carry out this task which, in point of fact, meant dropping the execution of the original plans for invading the British Isles. This was due mainly to the relative strength of the naval forces which was unfavorable for Germany.

As is seen from the above, in the first stage of the war naval forces had a very considerable effect on its course: the Hitler invasion of England was put off due to the might of the British Fleet, however, with the aid of the Fleet the Germans occupied Norway and were able in the first months of the war to inflict great losses on shipping and England's economy as a whole.

The treacherous attack of Fascist Germany on the USSR in which an overwhelming part of the armed forces of Germany and her satellite participated determined the beginning of a new stage in the course of the world war, drastically changing the entire situation in the theaters of military operations.

Eastern Europe, where the fate of the entire Second World War was decided, became the main theater. It was precisely there where Germany and her satellites concentrated their main forces. All other theaters of military operations were transformed into secondary theaters. That is why the role of the navies in the war and their effect on its overall course cannot be regarded separately from the events on the Soviet-German front.

The attack of the Hitlerites on the Soviet Union and the transfer of all of their military efforts to the East had an immediate effect on the course of the armed struggle in the other European theaters. In particular, the air attacks against England and her sea communications were reduced. Again, just as in WW I, only mainly submarines operated against the British shipping, and now they did not have the requisite combat support on the part of the other naval forces which permitted the British without any particular difficulty to strengthen the defense of her sea communications.

In considering the Soviet-German front to be the main one, the Hitler command sent not only the main army and air forces against the Soviet Union, but also a considerable part of the Navy. Thus, major [18 surface ships and many submarines were transferred to bases in Northern Norway for operations against the communications linking our northern ports with the ports of the allies. Therefore, the "Battle of the Atlantic" was shifted to the battle with German submarines which had already become commonplace for the British and Americans. However, even under these conditions, despite the furious development of ASW forces, the Anglo-American were able only to reduce losses from German submarine operations, but were not able to force them to refrain from active operations against communications.

The entire course of the war showed that the deciding role in the defeat of Hitler Germany and her allies belonged to the Soviet Union and the events in the main, Soviet-German front had a vast effect on the character of the armed struggle in all other theaters of military operations. The success of the main major amphibious operations of the allies in Africa and Europe became possible only owing to the heroic efforts of the Soviet Army and Navy who prevented Hitler from taking troops from the East which were essential to repulse or destroy the Anglo-American landing forces.

The statements of state and military leaders of the countries of both groups attest to the effect of the events of the Soviet-German front on the course of military operations on the other fronts. Thus, in a letter to Mussolini on 21 June 1941 Hitler reported: "An attack on Egypt before fall is ruled out,"* when, in his opinion, military operations against the USSR would be concluded. The well known Hitler general Guderian indicated that "after the failure of the CITADEL plan (the battle for Kursk--author), the Eastern front took away all forces from France."**

* Les lettres secrètes echangèes par Hitler et Mussolini. Paris, 1946, p. 126.

** Cited by L. M. Yeremeyev. Glazami druzey i vragov. O roli Sovetskogo Soyuza v rasgrome fashistskoy Germanii (Through the Eyes of Friends and Enemies. The Role of the Soviet Union in the defeat of Fascist Germany). Izd-vo Nauka, 1966, p. 150.

In a report to the War Cabinet on 20 January 1943, British Prime Minister W. Churchill noted that "All of our military operations taken together are on a very insignificant scale in comparison... with the gigantic efforts of Russia.* He is also attributed with such widely known statements as "The Russian resistance broke the backbone of the German armies"** and "it was precisely the Russian Army which took the life out of the German war machine and at the present moment is holding by far the largest part of the enemy's forces on its front."***

* W. Churchill. Op. cit. Vol. III, p. 613.
** Ibid, Vol. II, p. 352.
*** Correspondence of the Chairman of the USSR Council of Ministers with the U.S. President and the Prime Minister of Great Britain during the Great Patriotic War 1941--1945. Vol. I, 1957, p. 260.

U.S. Secretary of the Interior Ickes wrote in 1944: "The greatest gift that the Russians gave the United Nations was time, without which England would not have even been able to recover from the wounds received at Dunkirk and the United States would not have been able to expand military production and create armies and fleets.... "*

* Krasnyy Flot, (Red Fleet), 27 June 1944.

And a major U.S. figure Stettinius, said in 1949: "The American people should not forget that they were not far from catastrophe. If the Soviet Union had not been able to hold its front, the Germans would have been able to take Great Britain. They would have been able also to seize Africa and, in this event, they would have succeeded in making a beachhead in Latin America."*

* E. Stettinius. Roosevelt and the Yalta Conference. London, 1950, p. 16.

On 2 December 1944 General de Gaulle said: "The French know what Soviet Russia did for them, and know that it was precisely Soviet Russia who played the main role in liberating them."*

* Sovetsko-frantsuzskiye otnosheniya (Soviet-French Relations), 1959, p. 340.

Many prominent Soviet military figures note the direct effect of the events on the Soviet-German front on the course of combat on the other fronts. Thus, Marshal of the Soviet Union A. A. Grechko stresses that "The victory at Stalingrad, Kursk, on the Don and in the Caucasus considerably strengthened the positions of our allies in the Near East and in the Mediterranean Basin and made it easier to gain a victory in North Africa over the armies of General Rommel."*

*A. A. Grechko. Bitva za Kavkaz (The Battle For the Caucasus), Voyenizdat, 1971, p. 546.

The victories of our armed forces in 1943 foiled the plans of the Hitlerites to stabilize the situation on the Soviet-German front and to shift troops to the West to repulse the expected allied invasion of Europe to open a second front.

The landing of allied troops at Normandy in June 1944 was the largest amphibious operation in history. Preparations for it were carried out over a 30 month period in a relatively calm situation. Vast allied naval, ground, and air forces participated in the operation: more than 2,800,000 troops, about 6,000 combatant and landing ships, about 11,000 combat aircraft, and up to 2,000 transport aircraft.*

* Vtoraya mirovaya voyna 1939-1945 gg. (The Second World War 1939-1945). Voyenizdat, 1958, p. 641.

With the opening of the second front in the summer of 1944 the USA and England made their greatest (albeit tardy) contribution to the cause of victory over Fascist Germany. However, the consciously delayed opening of the second front was not the turning point in the

course of the war as Western falsifiers of history depict, for by that time there was already no doubt of the fact that the Soviet Union was in condition to defeat Fascist Germany and to wind up the war without the aid of the allies. As early as 1943 US President F. Roosevelt stated: "...If things continue as they are now in Russia, then it is possible that by next spring the second front will not even be needed."*

* E. Roosevelt. Ego glazami (Through His Eyes), Moscow, 1947, p. 161.

Clearly the importance of the second front at that time was no longer decisive. And it was not the opening of it which aided the Soviet armed forces in the struggle with Hitler Germany, but, on the contrary, the victories of our troops not only permitted the allies to marshal vast forces and achieve a twelve-fold superiority over the Hitlerites in naval forces and a twenty-two-fold superiority in the air, but also created favorable conditions for the allied invasion of western Europe.

As for the war at sea, the navies of the belligerent countries carried out major tasks which had a great effect on the overall course of the war. Thus, the successes of the allies in the Mediterranean theater, first in North Africa and later in Italy, to a certain degree were determined by naval operations supporting the landing of major landing forces in Northwest Africa, on the island of Sicily, and in Italy. The allied fleets disrupted the sea logistics of the Fascist troops of Rommel. These successes on a secondary front of the struggle played their own positive role in the course of the war, although they attracted relatively small German forces.

A different type of situation was created in the armed struggle in the Pacific Ocean, where the fleets were of greater import than in the European theaters. However, also here the effect of the general strategical situation created on the main Soviet German front on the course of military operations is unquestionable. The selection by the Japanese of a Southern option for the start of their aggression, the refraining from a further continuation of the offensive, and the transition to a strategic defense were the consequence of the disruption of the Blitzkreig and the series of defeats inflicted on the Hitlerites by the Soviet armed forces.

In the Pacific Ocean the amphibious landing operations by both sides and the disruption of Japanese shipping by the blockading operations of the American Fleet became the basic type of combat activity. [20
All other combat operations were essentially only in support of landing or antilanding operations.

The war here began on 7 December 1941 with relatively equal forces on both sides (Table 2) with a surprise attack by the Japanese on Pearl Harbor, the main base of the American Pacific Fleet. As a result of the attack, Japanese carrier aircraft sunk or damaged all eight

Table 2

Composition of Naval Forces in the Pacific Ocean on 7 December 1941.

Ship types	USA	Great Britain	Hol-land	Total	Japan	Relative Strength
Battleships & battle cruisers	9	2	--	11	10	1:0.9
Aircraft carriers	3	-	--	3	10	1:3.3
Cruisers	24	8	3	35	36	0.97:1
Destroyers	80	13	7	100	113	1:1.1
Submarines	73	--	15	88	63	1.4:1

Data compiled from the Morskoy Atlas (Naval Atlas) Vol. III, part 2, line 30.

battleships in the harbor, one cruiser, and destroyed about 200 land-based American aircraft.* Within three days the Japanese had succeeded

* Morskoy atlas (Naval atlas), Vol. III, Part 2, line 30.

in sinking an English squadron in the Gulf of Siam, and in February 1942 [they sunk] a hurriedly assembled Anglo-Dutch-American squadron in the Java Sea. Japan had gained control of the sea which permitted her to carry out several amphibious operations in the first stage of the war. In two months the Japanese occupied the Philippine Islands, the Malacca Peninsula with the major British base of Singapore, Indonesia, Burma, and many islands in the Pacific Ocean. Japan seized the vast economic resources of Southeast Asia. However, as a result of the victories achieved on the Soviet-German front, particularly in the Battle of Stalingrad, which determined the turning point in the course of the entire war and which was consolidated by subsequent victories of the Soviet Army, already by 1943 the Japanese were refraining from further offensive operations and had gone over to a strategic defense.

Western historians assert that the turning point in the course of the war in the Pacific Ocean came before Stalingrad, when on 3 to 6 June 1942 four Japanese aircraft carriers and only one American carrier were sunk in a successful American engagement off the island of Midway. However, the relative strength of the naval forces after this battle

contradict such assertions, since even after it Japan retained supremacy at sea in forces: eight aircraft carriers (counting also those newly commissioned)* against four American carriers**. The Japanese

* Kodzima Noboru. The War in the Pacific Ocean. Tokyo, Vol. I, pp. 249-250.

** F.S. Sherman. American Carriers in the War in the Pacific. Voyenizdat, 1956, p. 104.

also had superiority in battleships and cruisers. Indeed, and also the nature of the combat operations following the Battle of Midway Island attests to the fact that it was in no way the turning point in the course of the war. Actually the Japanese continued to land landing forces, to conduct an offensive on New Guinea, and in the Solomon Islands, and to create a difficult situation for the Americans which was aggravated by the loss of two more of their aircraft carriers, the WASP and the HORNET.

W. Churchill wrote that in the fall of 1942 the Americans appealed to England with a request to aid them with aircraft carriers. "...We understood that a serious crisis had arisen in the Solomon Islands."*

* W. Churchill. The Second World War. Vol. V, 1955, p. 28.

By that time the U.S.A. had only two carriers left there, the SARATOGA and the ENTERPRISE (and those were damaged). The real threat of a Japanese invasion of Australia arose. How can one speak of a turning point in the war in the Pacific after Midway?

Also unfounded is the attempt by Western historians to represent [21
as a turning point of the course of the war in the Pacific the landing in August of 1942 by one (!) marine division on the island of Guadalcanal, which conducted protracted battles with the Japanese forces with varying success. By the way, the President of the United States, F. Roosevelt, in a report to Congress on 7 January 1943 indicated that the actions at Midway and Guadalcanal islands "were essentially defensive. They were a part of the strategy of containment which characterized this phase of the war."*

* The President's War Addresses to the People and to the Congress of the U.S.A., Washington, 1945, p. 61.

Yet suddenly in a situation which was so difficult for the allies the Japanese Imperial Staff on 31 December 1942 decided to drop the offensive strategy and go over to the defensive. It is quite evident that the most important reason for this was the victory of the Soviet

troops at Stalingrad, when for the first time the faith of the Japanese military leaders in the power of the German Army was really shaken. The Japanese leaders recognized that "if Germany...weakens, in a short time Japan will find herself at the head of the world coalition."* The Japanese understood that "the victory of the Soviet Army at Stalingrad was a blow not only to Germany but also to Japan."**

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* Nyurnbergskiy protsess. Sbornik materialov. (The Nurenburg Trial. Collection of Materials), Vol. I, Gosyurizdat, 1952, p. 402.

** Istoriya voyny na Tikhom okeane (History of the War in the Pacific Ocean), Vol. IV, Foreign Literature Pub. House, 1955, p. 16.

Thus, the actual course of the armed struggle quite clearly shows that the victory of the Soviet armed forces at Stalingrad was the beginning of the pivotal events in the course of the entire Second World War.

Yet nevertheless Western historians speaking out as defenders of their imperialist masters, who are not interested in an objective treatment of history, are now striving to distort history in every possible way. Thus, in the "History of the 20th Century" published in England by the firm "Purnell," they again return to the attempt to reduce the importance of the Battle of Stalingrad. In enumerating the most important events of the war which brought Germany agony, they speak of the battle off Midway, of "The Battle of the Atlantic," and of the battles at El Alamein, and only after this do they refer to the battle of Stalingrad, attributing limited significance to it (and by that only a significance pertaining to the war in Eastern Europe) although five enemy armies were defeated and taken prisoner in it, which shocked the entire military machine of Fascist Germany and her allies.

Enough has already been said above concerning the battle of Midway Island. The struggle of the navies for communications in the Atlantic Ocean in 1942 also did not lead to any sort of decisive results which could have served as the beginning of Germany's defeat. Yet the battle near El Alamein in which two small armies with a total strength on both sides of about 250,000 men (about 2% of the number of troops fighting on the Soviet-German front!) of course could not be the turning point in the course of the war.

The course of the war in the Pacific theater once more confirmed [22
that the political goals which were supposed to be implemented by military means were directly dependent on the capabilities of the economy and of the armed forces. It is precisely this which explains why Japan so attentively followed the course of the struggle on the Soviet-German front and the position of her main partner, and changed her plans depending on this.

On 1 February 1943 Japanese troops began to evacuate the island of Guadalcanal, and by fall a new, shorter defense line had been establishe . In the summer of 1943 the Japanese tightened their defensive belt even more, withdrawing it to the Caroline and Marina Islands, and the main forces were brought back to rear bases. By the fall of 1943 the economic advantages of the U.S.A. were felt and control of the sea irrevocably went over to the Americans, which permitted them to initiate offensive actions.

With the shift to the defensive, troop shipments by sea between the home country and the defense lines and also the delivery of materials to Japan from occupied territories took on more important significance for the Japanese. However, these shipments were more vunerable in the Japanese defense system. And when the initiative was shifted to the Americans and they began offensive operations, then the Japanese turned out to be incapable of either maneuvering forces on the defensive lines or of delivering strategic materials to Japan. The struggle against sea communications took on a one-sided character. Japanese submarines operated only against major enemy surface ships and were not used against his communications lanes. Therefore, American shipping remained essentially unopposed. The Americans, on the other hand, from the very outbreak of war, attacked enemy shipping (mainly with submarines). Beginning in 1944 American aircraft and surface ships were also involved in these operations. In this connection, due to the weakness of the defense of the Japanese communications their attacks were delivered under the most simple, almost training-like conditions.

Moreover, taking the defeats of the Hitlerites on the Soviet-German front into account, the Japanese avoided the risk of employing the main forces of their fleet to defend the occupied islands, relegating the execution of this task to small garrisons who had no naval or air support.

As a result of the operations of the American forces against the sea communications, the economic potential of Japan by 1945 was undermined, and she was unable to replenish the losses in warships and aircraft, while at the same time the USA continued to accent the construction of ships and aircraft (as the figures in Table 3 attest). This permitted the USA to create a decisive superiority in forces in the chosen areas and to control the conduct of operations in the area. At the same time in order to disrupt Japan's economy, the USA began to make systematic air attacks on industrial targets.

The offensive operations of the American Fleet began in late 1943 when favorable conditions emerged for this as a result of the victory of the Soviet armed forces over the troops of the main partner of the Fascist bloc--Hitler's Germany. In this connection, the operations of the Americans were first directed not against the main military forces of the enemy, but rather against peripheral garrisons located on the islands occupied by them. Having the advantage in naval forces, the [23

Table 3

Composition of U. S. Fleet

Ship type	Year 1941	1944
Carriers (heavy, light, escort)	7	125
Battleships	16	23
Cruisers	36	67
Destroyers & escorts	180	879
Subchasers	--	900
Submarines	112	351
Landing craft, ships & auxiliaries	--	75,000+

* Data from book by L. M. Yeremeyev and A. P. Shergin "Submarines of Foreign Navies in WW II," (p. 375) and "Handbook of the Ships of the Navies of the World. 1944" (Voyenizdat, 1945, p. 295).

Americans were able to select the direction of the attacks which confused the Japanese, and they were late in giving support to their garrisons.

The Americans, having broken through the outer defensive line of the Japanese and having consolidated themselves by landing landing forces behind them, went over to actions against the inner line of defense in the fall of 1944. The Japanese employed their main naval forces to oppose the landing of the Americans in the Philippine Islands. Here in the waters of the Philippine archipelago the largest naval engagement of its time also took place in which significant forces on both sides participated (Table 4). As a result of the battle, the Japanese Fleet suffered heavy losses: four aircraft carriers, three battleships, ten cruisers, 11 destroyers, and two submarines.* This

* Op. cit. Naval Atlas, Vol. III, Part 2, line 48-b.

Table 4

Composition of the U. S. and Japanese Naval Forces in the Battle of the Philippines

Ship type	U.S.A.	Japan
Aircraft carriers	34	4
Battleships	12	9
Cruisers	23	20
Destroyers	113	32
Submarines	29	17

Data taken from Naval Atlas, Vol. III, Part 2, line 48.

battle had a considerable effect on the further course of military operations in the Pacific theater, predetermining the success of the American capture of the Philippines and the subsequent shift of their amphibious operations toward Japan itself.

The last American amphibious operation was the landing on Okinawa in 1945. The struggle for this island lasted three months despite the six-fold superiority of the landing forces over the enemy garrison and the complete American control of the sea and air.

The attacks by American aircraft on the cities and ports of Japan were continually expanded, but even in 1945 Japan's Army had suffered very insignificant losses on the Pacific islands. The most powerful and combat capable grouping of Japanese ground forces, the Kwantung Army in Manchuria, not only was unweakened by military operations, but continued to be strengthened, being supported by the military economic base of Japanese imperialism, the industry of Manchuria and Korea.

In August 1945 Japan still had major armed forces at her disposal: five million men, 10,000 aircraft, and about 600 warships.* This permitted her to continue the war despite the capitulation of Germany and the loss of Japanese occupied territories. The Americans, not relying on their own possibilities of forcing Japan to surrender in a short time, worked out plans for landing operations against Japan itself according to which the landing of troops on the island of Kyushu was scheduled for late 1945 and in the Tokyo area in 1946 or even later. The plans called for a prolonged struggle with the employment of major ground forces which the Americans did not have. However, the Americans had insufficient superiority in naval forces to achieve success.

* Op. cit. The Second World War 1939-1945. p. 789.

That is why they needed the USSR to enter the war against Japan. This was precisely the reason for so many continual appeals by Churchill and Truman to Stalin to begin military operations by the Soviet Army in the Far East.

In fulfilling its obligations as ally, the Soviet Army and Navy crushed the Kwantung Army with powerful blows which also forced Japan to surrender.

In examining the events which took place in the Pacific and Far [24
Eastern theaters of military operations in the years of the Second World War, we cannot fail but to stress that the struggle between Japan and the USA was waged for a long time here primarily by naval forces. Thus, the Japanese were guided by strategic concepts stemming from their military doctrine which stressed the seizure of vast territories (not commeasurate with the actual capabilities of exploiting and retaining them) and greatly oriented toward the success of her ally in the aggression, Fascist Germany. The Americans, however, conducted their operations in the peripheral regions of the Japanese defense zone in accordance with the "palm-tree to palm-tree" strategy which permitted only a methodical step-by-step approach of military operations toward the homeland of the enemy. These operations had little effect on the Japanese ground forces whose main forces practically did not even participate in the war against their main enemy in the Pacific Ocean--the USA. The Americans also did not attack either the Kwantung Army or the sea communications linking them with Japan. The military industrial base in Korea and Manchuria also did not suffer any opposition, although it was also located in a zone accessable to the American attack forces (especially carrier aircraft). The Americans extended their operations to this zone only after the Soviet Union had entered the war with Japan, had smashed the Kwantung Army, and was preparing the final blow. American operations in this period were expressed mainly in the active laying of mines on the routes of the Soviet naval forces driving toward the coast of Korea and the Liaotung peninsula. These operations had the goal not so much of weakening the Japanese Army as hindering the decisive movement of Soviet naval forces in support of Soviet troops, i.e., hindering their own ally in doing just what the American command had studiously avoided throughout the entire war--direct opposition to the enemy forces making up the basis of his military might.

With such a strategy clearly the war in the Pacific theater would not have been concluded even by 1946 without the participation of the Soviet Union despite the fact that the USA employed a nuclear weapon in it. Only the crushing of the Kwantung Army by the Soviet armed forces sharply reduced the military potential of Japan and her capability to continue military operations. An analysis of the operations of the American Fleet supported mainly by an overwhelming superiority of forces also serves as a basis for such an assertion. However,

while having large numbers of submarines at their disposal, the Americans employed only a small part of them for operations against Japan's communications. An average of no more than 15 submarines were at sea at one time (Fascist Germany operated this number of submarines at sea when she had only about one third as many as the Americans).

In the course of the war the lack of preparedness of the Japanese Navy to protect sea communications was revealed with ever greater clarity which prevented her from using the resources of the occupied territories to build up her power. Nevertheless, despite the exceptionally favorable conditions, American operations against Japanese communications were not distinguished by activity.

As was already indicated above, the reasons for the Japanese shift to a strategic defense were not at all due to the actions of the American Fleet or to the fact that after the Pearl Harbor catastrophe the USA expanded construction of aircraft carriers, as Western historians assert. These reasons lie in the defeat of the German Fascist army at Stalingrad, which convinced the Japanese military leaders of the hopelessness of the offensive strategy which they had adopted and of the blind devotion to her ally in the anti-Communist aggressive bloc.

Consequently, such prolonged military operations in the Pacific Ocean, in which the forces of the Japanese, American, and British fleets took part, in themselves could not have brought a rapid close to the war without the decisive intervention of the powerful forces of the Soviet land Army which brilliantly carried out its assigned missions, forcing Japan to capitulate, thereby victoriously concluding the Second World War.

(To be continued).

Photograph captions, p. 17: The British attempt to break through to Narvik which was occupied by German forces. 13 April 1940.

p. 19: The landing of Anglo-American troops at Normandy. The artificial port MULBERRY A. Trucks delivered in LST's drive along the LOBNITZ pier to the causeway. 6 June 1944.

p. 21: The Japanese attack on the American naval base at Pearl Harbor. In the foreground, the burning battleship WEST VIRGINIA, behind it, the sinking battleship TENNESSEE. 7 December 1941.

p. 23: Japanese kamikaze attack on the American aircraft carrier ESSEX. 25 November 1944.

MORSKOY SBORNIK, No. 9, 1972, pp. 25-27.

FLEET ENGINEER

by Rear Admiral-Engineer B. Akulov

The achievements of scientific and technical progress have led to a revolution in military affairs, and nuclear missile weaponry and new power plants have appeared. The latest power plants--nuclear, gas turbine, diesel-gas turbine, and steam turbine with high performance characteristics have been put into ships. Complex automated systems for controlling weaponry, systems, and propulsion plants are being widely used. [25

Experience in the employment of modern control systems and the latest power propulsion plants has confirmed their high performance characteristics, reliability and failure-free operation in different climatic conditions.

This was affirmed by the round-the-world cruise of a group of nuclear-powered submarines under the command of Vice Admiral A. Sorokin.

The capability of warships to cruise for a long time at great distances from bases with reliable and prolonged employment of all forms of technical equipment and armament is forcing a new re-examination of the role and place of the engineering officer of a modern combatant.

Today the officers of the engineering department are engineers with a broad profile. They ensure the failure-free operation of the main power plant, and all of the vitally important machinery and systems are in their hands.

The supply of all forms of electric power for missile complexes, technical gear for navigation and communications, sonar and radar, shipboard automatic equipment and computers, monitoring of the operation of shipboard systems for water supply, and air conditioning and damage control with respect to machinery and the ship as a whole--all of this must be overseen daily by the engineering officer. Here he is the main assistant of the ship's commanding officer.

Aboard a submarine the engineering department head has the responsibility for direct control over diving and rising, and the buoyancy and trim at high submerged speeds. This demands a quickness of reaction, and the ability to make the only correct decision in an instant. Rapid trimming requires great skill when the load on the submarine changes instanteously, and when the maneuvering with respect to depth takes place during under-ice navigation and when rising vertically in order to approach the ice or to surface in a polynya.

One of the most important duties of an engineering officer is the direct leadership of damage control when there is combat or accidental damage. Here his tactical and special level of training is also displayed: the ability to ensure the ability to remain afloat and explosive and fire safety under different variants in the tactical situation and to correctly and quickly analyze the true condition of the ship and its capability for further employment. According to the Naval Shipboard Regulations the orders of the head of the engineering department with respect to maintaining the water tightness of the hull, fire-fighting safety, and damage control must be carried out by all of the ship's company. This circumstance gives the engineering officer an even greater responsibility for his personal training in questions of ship theory. The preservation of the viability and the ability to remain afloat requires of him a deep knowledge of the specific features of underwater navigation.

The engineering officer is the leader aboard the submarine with respect to knowledge of the equipment of his own ship, and the systems and machinery supporting its combat operations. This makes it incumbent upon him to skillfully organize the efficient interaction of numerous action stations located in all compartments of the ship when carrying out essential maneuvers and evolutions under the most difficult conditions.

In the process of navigating, the engineering officer systematic- [26
ally checks the work of the technical equipment and the correctness of their operation, he analyzes the technical condition of the ship as a whole, organizes preventive inspections in a timely manner, leads the elimination of casualities in the machinery while displaying engineering creativity and initiative in this, and renders the requisite technical aid to the heads of other departments.

Specialists of the engineering subunit on a long cruise must possess the skills to carry out repair jobs in order to eliminate failures which in port are carried out through the efforts of the repair enterprises. Even during the preparation for the cruise the engineering officer must teach his subordinates to carry out all the responsible operations in the disassembly, assembly, adjusting and checking of any machinery under difficult conditions. Here he emerges as an experienced engineer-technician, an authority on repair matters. Reliable operation of the power plant on long and difficult cruises will only be ensured by a high level of training for the personnel.

The engineering officer is not just a highly proficient specialist, he is also a skillful teacher of subordinate personnel and the organizer of the combat and political training of his own subunit. Therefore only with outstanding schooling and faultless knowledge of the complex equipment is the successful operation of it possible.

By making use of every opportunity when tied up in port or on long cruises to improve the practical skills of subordinates and by educating them in the spirit of the strictest adherence to all the requirements of the regulations, instructions, and directives, and by teaching the ability to control machinery in emergency situations, the officer inculcates them with the feeling of personal responsibility for the work entrusted them.

The concern of a commander for political and military education, for special training, for their well being and spare time, and for the needs and requests for the rated and nonrated men holds an important place in the service daily life of the engineering officer.

Party and Komsomol organizations have been called on to render and are rendering comprehensive aid to him in these vitally important questions. Their duty is to foster the development in the navymen of high moral and combat qualities, through all forms of political and educational work, to mobilize them for the successful mastery of their specialities, to support order by the regulations, a high degree of discipline, and conscientiousness in every navyman.

Engineering officers have written more than one glorious page in the history of the Navy by their military and laboring deeds.

The work-loving cohort of Fleet engineers has always been famous for their high degree of training. And it is not surprising that the first officer in the Navy to attain the qualification of "Master of military affairs" was an engineering officer serving in the Northern Fleet, N. Bisovka.

Year after year the engineering service of the Navy is being expanded by graduates from the higher naval engineering schools in Leningrad and Sevastopol, and from the oldest forge of fleet engineering officers--the F. E. Dzerzhinskiy School. The professional-teaching staff (in the past they were, as a rule, shipboard engineering officers) of these schools are transmitting their own wealth of experience to the cadets and educating them in the combat traditions.

Some of the students of the naval engineering schools have themselves become creators of new propulsion plants, and others are successfully mastering methods of operating the latest equipment.

In the last two decades in the Navy a school of the engineering corps of the Navy has grown and has been tempered on long cruises of warships. Many engineering officers have travelled the path from lieutenant to admiral, from group leader of the engineering subunit of a ship (submarine) to force engineering officer, chief of the fleet technical directorate, and chiefs of central directorates (departments) of the Navy.

Engineering officers M. Budayev, E. Kul'nitskiy, V. Zarembovskiy, I. Petrovskiy, V. Leont'yev, A. Kotyash, A. Gerchikov, N. Garbuzov, N. Mamykin, N. Bisovka, and many others enjoy great respect in the [27
Navy. Beginning in 1963 dozens of engineering officers were awarded the military proficiency rating for officers of "Master of military affairs" in the Fleet. Among the Fleet engineers there are many who have been awarded high governmental awards and laureate titles for successful mastery of new equipment.

The Navy is incorporating all of the latest achievements of science and technology into its own development. The Communist Party and the Soviet government are displaying paternal concern about the further development of our Navy and about increasing its combat might.

The engineering officers together with the commanding officers of ships and specialists of other departments are making their own contribution to strengthening the Navy.

MORSKOY SBORNIK, No. 9, 1972, pp. 30-32.

THE SHIP'S ENGINEERING OFFICER

by Captain 3rd Rank-Engineer O. Myatelkov

Every day Captain 3rd Rank-Engineer Valentin Alekseyevich Mitin [30
goes through the compartments. He listens to reports attentively, by habit glancing around his "household" squeezed into the meager volume of spaces. His tenacious glance notices the slightest defect: "The wedge lock on the bulkhead doors is loose--tighten it...the injection-type decontamination device is not accurately set, find out why!"

And everything that the engineering officer says is listened to attentively and seriously, for how could it be otherwise--indeed aboard the warship, and even more so since it is a submarine, he is the real manager. Actually, his role is difficult to overestimate. In the charge of the engineering officer is a good three quarters of all of the machinery, systems, devices, and instruments, and almost half of the crew are his subordinates. Well, and as for the duties of the head of the engineering department they amount to one thing--to do everything so that the ship can proceed at a given speed, rapidly surface and dive, and so that all mechanisms can operate--in general so it can live.

If the ship's CO were to chose his officers himself, then certainly the future head of the engineering department would have to pass the most difficult examination--what a billet! And we believe that Captain 3rd Rank-Engineer Mitin would satisfy the requirements of the most exacting CO, for he confidently leads the largest subunit aboard an outstanding submarine, and knows his specialty faultlessly.

And the engineering officer has a great deal of work. The working day of the head of the engineering department is infinitely diverse.
And yet among the many duties there is one which Mitin pays special at- [31
tention. Under Article 314 of the Navy Shipboard Regulations the head of the engineering department has the responsibility "for keeping the ship's hull in good shape and for [keeping] the damage control systems, devices, machinery and means ready for action..." He must also check the training of the entire crew for damage control.

During his service life Valentin Alekseyevich [Mitin] has covered all of the seas and oceans washing our state. More than once he has been in critical situations. The officer well understands how important the readiness of the equipment for all operating modes is aboard a submarine, how essential it is for every submariner to have quick reactions, the ability to act without error, and to steadfastly and courageously bear great stresses in a complex situation. It is precisely because of

this that the Captain 3rd Rank-Engineer has a particularly serious regard for damage control.

Mitin knows that any master is powerless if he does not have the needed tool; and if this tool is needed to save the ship and to ensure its combat capability, then it must be faultless in all respects. And the officer, in checking the emergency equipment, definitely makes sure of their condition. If there is a hacksaw on the equipment board, then it should not only be lubricated, but also well sharpened and set; if a roll of wire is hanging there, it should really be soft, but solid and "binding," and not one that breaks right away in your hands; if nails are located on the equipment board, then they should be precisely those which are needed for the work. There is no sort of improvisation, no "perhaps" or "it'll do."

Everyone knows what fire safety means for any ship. The Captain 3rd Rank-Engineer undeviatingly looks after the condition of the fixed fire-fighting equipment and after the contents of the fire extinguishers. Let the pressure in a system drop a little, even within permissible standards, and he immediately issues directions to find out the cause and to eliminate it. The fire extinguishers are recharged aboard the ship strictly within the established periods. The officer uses this work for training.

The training of all crew members in damage control is not a simple task. Indeed the men must do it in a skillful, really high quality manner, otherwise too high a price may be paid later for errors, confusion, and lack of knowledge by the men of this vital science.

The primary point is the submerged watch. Every day prior to commencing their duties the submariners go to their combat training stations where they learn to combat flooding and fire. And although qualified specialists run this training, Valentin Alekseyevich [Mitin] does not miss any opportunity to visit there and observe the actions of subordinates and see with his own eyes who is capable of what.

He does not leave the enginemen, electricians, and mechanics alone during their duty hours aboard the ship. Emergency alarms and complex tactical problems are presented by the engineering officer to teach the men not to be afraid of difficulties. It is no accident that such
specialists as PO 1st Class V. Kolesnikov, Engineman Senior Seaman S. [32
Ignatov, Mechanic PO 1st Class V. Chepushtanov, and many others stand submerged watches in an exemplary manner.

And despite this the main thing for V. Mitin is the training of those who are teaching. And this usually begins with the department head himself showing the group leaders and petty officers what and how it must be done in one situation or another, how to seal compartments, and switch over systems and power lines, and he demonstrates tested operating methods in practice.

Then these methods are repeated by the leaders of the compartment parties, slowly thinking through each step. When they acquire the skill, they act more quickly, developing the habit. Only after this do they work with the personnel of the compartment or party. And this is done in order and also in detail.

Captain 3rd-Rank-Engineer Mitin does not tolerate going through the motions. "For three years, there is one tactical problem: "a leak in the convenient fifty-sixth frame"--"that is not my style," he says, "although unfortunately this sometimes happens."

Valentin Alekseyevich does not tire of reminding training leaders of the diverse situations which can occur in battle, and he himself creates difficult situations in the course of training. Aboard the submarine practice training sessions in the dark, in injection-type decontamination equipment, and in insulating gas masks with flooding have become normal.

The record exercises are the height of the crew's damage control training. Plans for them are developed by the engineering officer together with the executive officer with particular thoroughness. Some of them are easy: they include those problems already worked out daily in practice training sessions. Of course, in this case the actions of every man in the drill are sure and exact. But this is only a performance put on for the umpire or inspector, and is far from a check of the real combat schooling.

The submariners in the crew where officer Mitin serves train comprehensively and thoroughly for a drill. Then no "trick" problems or any sort of questions from demanding umpires put them in a bind--they confidently act under the most complex conditions.

In training for record exercises and in determining the problems, the engineering officer strives to take into account all of the most integrated actions between the individual crew members. The officer still remembers (and how many years ago it was) when he himself, without having studied the particular features of the hydraulic system, when checking the planesman, put the boat in such a position that they had to "blow the midship tanks" immediately. And today, in planning, let's say, a "leak" he does not forget about the electric motors located nearby, and in putting the hydraulic pumps "out of action" he does not "de-energize" the switchboards. Complications through a problem are okay, but maximum attention to safety is also essential.

The engineering officer resolves all questions connected with ship damage control faultlessly. The crew receives only high grades in drills. And Captain 3rd Rank-Engineer V.Mitin, the engineering officer of a submarine, deserves a great deal of credit for this.

Photograph caption, p. 31: "Soon we put to sea. Has everything been checked?" Captain 3rd Rank-Engineer V. Mitin asks the engineman team leader, CPO A. Panov.

p. 32: Another regular training problem.

MORSKOY SBORNIK, No. 9, 1972, pp. 33-35.

DZERZHINSKIY MEN

by Captain-Lieutenant N. Safonov

"Comrade Luk'yanchikov, I passed. I passed everything!"--the Lieutenant said to the Captain-Lieutenant-Engineer coming toward him. [33

"Well I congratulate you from the bottom of my heart. You have to survive the State Exams in School," said Leonid Mikhaylovich smilingly squeezing Abramov's hand in his broad palms.

"Well, now, Nikolay Pavlovich go to your subordinates. They've been waiting for you for a long time."

Leonid Mikhaylovich [Luk'yanchikov] watched the departing Lieutenant and recalled how once he himself, being a young officer, was just as happy with his first very small successes.

It is true that it was more difficult for him to prepare for authorization to command a subunit independently--the ship at that time was being overhauled. The engineering officers and personnel of the engineering department had to account for every minute. But this did not bother the Lieutenant. He immediately began to work "with all his might" on a level with the others, penetrating into every detail and showing his own knowledge and skill.

Yet indeed, at that time in going up the brow to his future home he thought that now they would begin a long and uninteresting talk with him about the ship, the service ahead, and the conduct of a shipboard officer...

But the CO who met him asked with a slight Caucasian accent: "Have you eaten?"

"Yes sir."

"Did you ask for the ship or did they assign you here?"

"I asked for it," replied Leonid, and softly added: "I've dreamed of submarines since I was a boy."

"That's commendable," said the Captain 2nd Rank, and then, pointing to an officer sitting there, he said: "And this is your direct superior, the engineering officer. By the way, he graduated from Dzershinskiy [Naval Higher Engineering School] like you did. I think that you will quickly speak the same language. Get yourself settled--and your affairs."

In a short time there was also a talk with the CO's Deputy for Political Affairs. Having asked about his family and about the work in Komsomol, he then literally said the following:

"We would like you to find a real home with us, and cherish the ship's traditions. The submarine has a good crew. All the combat training missions are carried out with outstanding grades. If the area which you are responsible for is not in service, and it can be put in service by your own efforts, then there is no going ashore until it is. The men carry out all work according to their conscience. If you don't understand something, ask, don't be shy."

And the work began. Already after the first two weeks Leonid Mikhaylovich [Luk'yanchikov] felt that he was needed aboard the ship. It is true that he had to work intensely and a great deal aboard the ship. But beside him were experienced submariners such as A. Shmelev and N. Kazakov. They knew their work faultlessly. And they did not get excited even in the most difficult situations. Lieutenant Luk'-Yanchikov picked up their skills and acquired experience.

The department head was A. Spiglazov, a good tutor for Leonid Mikhaylovich. An experienced teacher and a competent engineer, he often prompted and then showed the Lieutenant what had to be done in one situation or another.

Luk'yanchikov applied himself with zeal to anything entrusted to him. This helped him to master his responsibilities more quickly than other officers. He was known as an efficient and active officer.

When after many intense days and nights he received a laudatory testimonial from the CO, then he involuntarily thought: "Now I have to feel that it will be easier." But literally within a half hour he had to drop this thought. At that time he was talking with a young seaman. The Lieutenant was taking an interest in the sailor's skills, and tried to understand whether or not he liked to work with the equipment. They did not finish the conversation.

"Ah, there you are," he heard the department head's voice behind him. "Tomorrow you will conduct the specialty training classes in my
stead. The subject is written here," and he gave the Lieutenant the [34
log. In leaving, the Captain 3rd Rank said in a low voice: "It's better to talk sitting down. Yes, it's true as they say, there is no truth in the legs. It seems like a small thing, but it helps to make the talk a more believable tale."

Immediately after the conversation Luk'yanchikov began to prepare for the classes. He assembled the necessary materials, attentively looked through the supplementary literature, and selected diagrams and

charts. Yet despite this he was pretty nervous. The theoretical part dragged, he permitted many small inaccuracies in the demonstration, and indeed he spoke without confidence.

The flag specialist* who attended the classes made a detailed cri-

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* Flag specialist--The fleet or force staff officer having the ultimate responsibility for the combat readiness, training, and correct employment of weapons or equipment in a given specialty, e.g., guns, ECM, engines, etc.

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tique. He advised how best to act in order not to repeat the errors, and recommended that he visit the classes of experienced officers more often. After the flag specialist had departed, Leonid compiled a personal schedule for the winter training period. In it he devoted much space to methodological training. Both the department head and the executive officer approved his desire for this.

Luk'yanchikov passed his combat maturity exam when he was already a Senior Lieutenant and a 1st Class Specialist.* At that time the

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* Class Specialist--An officer or enlisted man who passed the officer or EM proficiency test in his specialty. There are 3rd, 2nd, and 1st class specialists, as well as master specialists.

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submarine was at sea. The stormy weather was no joke. It was difficult to stand watch at the time. The deck continually departed for somewhere right out from under your feet, and the ceaseless rolling weighed on the nerves. Even the older hands were quiet and the new ones were not seen at all.

It was also difficult for Luk'yanchikov. But he tried to keep himself under control and watch the work of his subordinates. He aided them with advice and work.

"Senior Lieutenant Luk'yanchikov report to the Department Head," suddenly resounded in the ship.

Within a few minutes he reported: "Comrade Department Head..."

The department head's assignment was unusual. It was essential to eliminate a leak in a pipe and to do it as quickly as possible so that it would not stop the [propulsion] system.

For almost a whole day Luk'yanchikov figured, sketched, and measured. He went over dozens of methods and variants of patching cracks. He reported the best one to the department head.

"Luk'yanchikov's patch," as it was dubbed in the force, withstood all the tests of the ocean. And the influence of its inventor waxed still further. He was again given an incentive award for his initiative work.

On the next cruise Leonid Mikhaylovich went as the head of the department. True, it was only temporary, but the duties and responsibilities were no less because of this. It was precisely then when the Dzerzhinskiy Higher Naval Engineering School graduate Lieutenant Nikolay Abramov arrived to serve aboard the ship.

In the first meeting the officers talked.

"Our job is not easy," said Luk'yanchikov. "But as they say, God helps those who help themselves. Where there's a will, there's a way."

Knowing how difficult it is at first to get used to sea duty, Leonid Mikhaylovich attentively followed the Lieutenant's work. If he saw that it was going poorly, then he "accidently" turned up next to him.

But it was not only the bad weather that bothered the Lieutenant at times. He often got mixed up in the work of the petty officers--a sickness that many young officers have. The department head advised Abramov to consult the Navy Shipboard Regulations more often and not to substitute for the men without the slightest need for it.

Luk'yanchikov actively aided the officer in preparing for the examinations for authorization to command his area of responsibility independently.

The joint efforts soon bore fruit. At a regular Party meeting, when Luk'yanchikov was accepted as a CPSU member, the Communists spoke warmly of his deeds. They recalled his first steps aboard ship, they did not miss the fact that he headed a group studying the biography of V. I. Lenin, that already for the second year he was considered the best political studies group leader, that in a short time he had become a 1st Class Specialist, and that he had introduced rationalizing proposals...

The meeting decided that he was worthy of being a member of the Communist Party of the Soviet Union.

Photograph caption, p. 34: Captain-Lieutenant-Engineer L. Luk'yanchikov checks the results of the work of subordinates.

p. 35: In the damage control laboratory the laboratory chief, Captain 3rd Rank-Engineer I. Bordyanskiy, familiarizes the cadets with submarine systems.

MORSKOY SBORNIK, No. 9, 1972, pp. 36-38.

THE BIRTHPLACE OF SHIPBOARD ENGINEERS

by Doctor of Technical Sciences, Professor
Rear Admiral-Engineer A. Sarkisovyy,
Head of the Sevastopol Higher Naval Engineering School

In comparison with our other Naval schools, the one in Sevastopol is one of the youngest. [36 Not even its first alumni have ever fought in a war. Nevertheless, the School has absorbed the finest traditions of the Soviet Army and Navy, and is enriching them with new ones born during the technical revolution that has taken place in the Navy, and is imparting outstanding fighting efficiency and morale to its graduates. We are happy that the officers who have received their military education with us and are now sailing on all the world's seas are carrying out their arduous watch with honor and, while doing so, are displaying the knowledge required to control modern combat equipment, military skill, and courage worthy of wartime heroes. Suffice it to say that more than 150 of our graduates have been granted awards by the government.
that more than 150 of our graduates have been granted awards by the government.

The cadets value this morale very highly and pass it on, like a baton, from one generation to the next, each adding his own contribution. Here are two examples.

Cadet V. Muratov, on a short leave in Nal'chik, helped disarm and detain an armed criminal, disregarding the dangers involved. A letter of thanks from the Ministry of the Interior in Kabardino-Balkariya was received by the School with citation for V. Muratov.

Cadet A. Tanaschishin displayed heroism when fighting a fire in Apsheronsk. A warehouse full of commercial products was on fire, and the fire was threatening homes and a large store. A. Tanaschishin rushed to the center of the fire. Neither burns nor the great danger to his own life stopped him. He rolled all the burning barrels of fuel out of the warehouse and in this way eliminated the danger of the fire spreading to the houses.

The material in the School's museum tells of these and other examples of our students' courage. It is a successful illustration of the Soviet people's rich ideological arsenal, and is used actively by commanders, political workers and faculty members when educating the students.

The School prepares highly-qualified officers--engineering officers--who are fit to manage personnel and operate the power plants of modern surface ships and submarines. From the point of view of general education and the methodology of the training process, our system differs little from the organization of training in the country's other higher educational establishments, since instruction is conducted according to the single program established for higher schools.

The school offers everything necessary for the students' acquisition of knowledge, the conduct of research and the organization of leisure time. The many laboratories and lecture rooms are provided with the most modern equipment and accurate measuring devices. Special trainers and other technical resources make it possible to approach actual shipboard conditions in the training.

We have our own computer center with the most modern computers. [37
It is used not only in support of the teaching process, but also in research carried out in the departments and in many of the laboratories.

The education of future ship engineering officers is a many-sided and complex matter. Only highly-educated officers and teachers are capable of carrying it out effectively. Currently, our pedagogical collective includes two doctors of technical sciences who hold professoral status, and more than 50 candidates of sciences and docents. The staff of the School have written a number of scientific works and text-books that are used not only by students in Higher Naval Engineering Schools, but also by students in many of the country's higher educational establishments that graduate engineers for the ship-building industry and engineering officers for the merchant marine.

The revolution in the military field has faced us with more and more new problems. An unavoidable increase in the number of teaching disciplines, with the retention of the former period of training has demanded an intensification of study and the perfection of the teaching process. This work is inconceivable without serious scientific research, and we are carrying this out. The recommendations made by the Council for the Scientific Organization of the Training Process are first tested and then introduced into practice.

The cadets also participate actively in scientific research, working in Scientific Society groups under the departments. Their creative activity is closely linked with their studies and is a development of them. At the same time the cadets' work often has practical value for the entire Navy--for example, the works written by the activists of the Scientific Society groups M. Prokhorov, V. Ikonnikov, S. Yunak and others. In 1971 two of our graduates, A. Yershov and S. Martirosyan, were awarded citations by the Minister of Higher and Specialized Secondary Education of the USSR.

The graduates of our School are not simply engineers. They are officers--commanders of subdivisions on board warships. They are required to manage not only equipment, but also their subordinates, to educate them, and to train them to overcome the difficulties of long cruises and for active participation in a combat situation. For this reason all the training process is structured so that students are prepared morally and physically for shipboard service and receive a thorough theoretical training. We fully understand that deep ideological conviction is one of the most important character traits of the Soviet officer, as was pointed out by the Minister of Defense of the USSR, Marshal of the Soviet Union A. Grechko, at an all-service meeting of workers from military training establishments. [39

A great deal of ideological work is being done at the School, and this is directed by the political section. The Department of Marxism-Leninism, headed by Candidate of Historical Sciences, Docent, Captain 1st Rank A. Lisun, works very fruitfully and hard. I should like to make special mention of the following pedagogues who are particularly enthusiastic about their work: Candidate of Historical Sciences Captain 2nd Rank A. Malyshev, Candidate of Historical Sciences Captain 2nd Rank E. Lebedev, and Candidate of Economic Sciences M. Zabolotnyy.

Naturally, ideological training is not only the concern of the Department of Marxism-Leninism. Not long ago a conference on the Party mindedness of the special disciplines was held at the School. Its resolutions and recommendations formed the basis of all the activity of the School's officers--commanders, political workers, and teachers. The Party and Komsomol organizations work with initiative. Prominent amongst them are the party organizations of the departments where the secretaries are Captain 1st Rank-Engineer R. Voronov, Captain 2nd Rank-Engineer G. Zezyuninskiy, the Company Party organizations headed by Captain 3rd Rank-Engineer L. Erayzer, Cadet V. Kremlevyy, and the Komsomol organizations where the secretaries are PO 1st Class V. Klimanov, PO 2nd Class V. Nikitin, and Cadet V. Novokhatskiy.

Thanks to the tireless work carried on by the Party and Komsomol members, their efforts have borne fruit and have been widely emulated in the Socialist competition in honor of the 50th Anniversary of the formation of the USSR. The School now has ten classes and twenty-nine sections that have been rated "Outstanding." The company commanded by Captain 3rd Rank-Engineer L. Erayzer has also been rated "Outstanding."

It goes without saying that the Command and the Political Section of the School, and the Party and the Komsomol organizations are far from thinking that everything is fine and there are no shortcomings in their work. But we are determined to do everything in order to ensure that year after year we provide the Navy with engineering officers who are more and more trained ideologically, highly-qualified, and highly disciplined.

Photograph captions, p. 37: Examination results are discussed at a meeting of the Bureau of one of the School's best Komsomol organizations where Cadet PO 1st Class A. Ryabchuk is the secretary.

p. 38: Cadet in the fourth year class, Communist CPO S. Khomutov is an otlichnik in training and a public spirited navyman.

MORSKOY SBORNIK, No. 9, 1972, pp. 39-41.

THE MAIN "SHOP" OF THE SCHOOL

by Docent, Captain 1st Rank-Engineer Yu. Fomin, Candidate of Technical Sciences

The training facilities of the Sevastopol Higher Naval Engineering School which have risen over the North Bay are seen from all sections of the heroic city. [39

Representatives of 24 nationalities, emissaries of all the fraternal republics of the country, daily expand their knowledge here, and prepare themselves to become engineering officers of the Navy, combining ideological conviction with exemplary military technical training, and command qualities with a high general and nautical training.

A highly qualified and comparatively young professional-teaching staff works at the School. The average age of the teachers is 40. Some 75% of them are doctors and candidates of science.

This is perhaps why the School in a comparatively short time has succeeded in achieving a rather high degree of organization of the training process, in creating their own kind of general purpose and unified laboratory base and a modern inventory of trainers, and in introducing machine methods of checking skills.

In upgrading the Party-mindedness of the teaching, improving its methodology, and in improving the physical and mathematical foundations of the courses being taught, the instructors are not forgetting the need for constant and close ties with the Fleet. The subject matter of the scientific studies of the School take the Fleet's needs into consideration. Since they themselves are former Fleet engineering officers, the scientists and instructors not only carry profound engineering skills into the cadet classrooms, but also valuable experience on sea duty. For example, one of the youngest department heads in the School, Docent, Candidate of Technical Sciences Captain 2nd Rank-Engineer V. Puchkov, was formerly the best engineering officer in the Red Banner Northern Fleet. Today, he is a good methods specialist, and skillful teacher who is working on his doctoral dissertation. Candidates of Technical Sciences Captain 1st Rank-Engineer I. Popov and Captain 2nd Rank-Engineer N. Mikhaylovskiy, who also formerly served in the North, are writing dissertations. They have a wealth of experience in operating shipboard power systems. A teacher in one of the departments, Captain 2nd Rank-Engineer Yu. Sorokin, was graduated from our School in 1938. He has been awarded the Order of Lenin for exemplary execution of command missions and for mastering new naval equipment.

We could continue with this list.

The training process is the main "production shop" of the School. The political department and the Party and Komsomol organizations have widely expanded Socialist competition for companies, classes, and sections to achieve "outstanding" grades, and for the upcoming jubilee--the 50th anniversary of the formation of the USSR. One of the classes of the second year course in which Communist PO 1st Class A. Ryabchuk is the section leader and Communist PO 2nd Class V. Nikitin is the secretary of the Komsomol organization have appealed to the entire personnel of the School to successfully pass the regular examinations citing the slogan "A 'C' Is Not A Komsomol Grade." This appeal has been supported by all the cadets.

The battle for better organization of the training process and better indicators in training continues. The competition is picking up force.

The rapid development of science and technology, the improvement in warships, and the increase in the volume of scientific information with an unchanged period of training have sharply increased the stress on the programs of the higher naval engineering schools and have packed the cadets' working day to the limit. The administration of the train- 40
ing process using the old traditional methods had become difficult and inefficient. Therefore in 1971 The Sevastopol Higher Naval Engineering School created a council for the scientific organization of the training process which was charged with the following tasks: improve the leadership of the training process by developing and introducing an automated information system; develop and introduce into the training process technical means for teaching and checking skills; improve methods for using the laboratory facilities; study the service experience of the School's graduates and the training practices of the cadets; study the work of the cadets and the teaching staff and further develop the professional selection and orientation of secondary school graduates; and study their individual traits.

Last year sections of the council achieved significant successes. Much was achieved by the sections headed by Doctor of Technical Sciences, Professor A. Sarkisov, Candidate of Technical Sciences, Docent V. Puchkov, and Candidate of Technical Sciences, Docent R. Prosuzhikh. The ideas presented by them were actually realized. There has already been an objective appraisal of the work of the departments in the School and an appraisal of the cadet workload, a detailed time-study is being made of the independent work of the cadets in all of the departments and by the discipline being studied, and the marks of the examination sessions are being analyzed by computer.

In the future based on an automated information system it is intended to create an automated system for administrating the training process with a computer and a dispatcher service capable of reacting

operationally to the slightest deviation of the process from the norm and of making the necessary corrections in it in time.

A great deal of attention is being devoted to the intensification of the training process by using various trainers with monitoring attachments, to the creation of systems for checking skills, [41 and to the introduction of technical training equipment.

From morning until late at night the machine trained and monitored class works using machines based on the KISI-5-type machines, and practice training sessions on trainers are held in the laboratories according to the training process schedule. Several of the School's departments are being equipped for classes with testing machine systems. By the end of 1972 it is intended to put into operation a prototype automated auditorium for lectures, and also an office for counseling of secondary school graduates in which all of the multifarious training, educational, a scientific sporting work of the School, the service of the graduates in the Fleet, and the organization of the work and spare time of the cadet will be widely illustrated. In this kind of office yesterday's school boy will be able to see all the complexity and beauty of the profession of a shipboard engineering officer and to confidently choose his path to the Fleet.

The School collective has many plans. All of them are goal-oriented toward the end that the engineering officers leaving the walls of the School will have a good theoretical and practical training. With all our heart we wish them outstanding training and smooth sailing.

Photograph caption, p. 39: In the internal combustion engine laboratory. The instructor, Captain 2nd Rank Ye. Zhevanik, tutors cadets V. Kharchenko and V. Ivanov.

p. 40: The School's library numbers more than 300,000 volumes. Librarian N. Chuprynia helps the cadets select the necessary literature.

p. 41: Leader of the diploma projects Captain 1st Rank-Engineer G. Chekin checks the blueprints of cadets of the fifth year course A. Sorokin and Yu. Morozov.

MORSKOY SBORNIK, No. 9, 1972, pp. 51-55.

WITH THE SHIPS, UNITS, AND FORCES OF THE FLEET

Red Banner Northern Fleet [51

There are duels which the crew will long remember.

...Having barely entered the test range, the large ASW ship began the search. Yet even before this the submarine began to maneuver. The crews had opposing missions: the ASW men, no matter what, had to detect the "submerged ship," while the submariners had to get away unnoticed. For the ship it was a matter of altering course, which looked like an intricate web on the navigator's chart. Sweep, and sweep again. There were as many of them as there were CO's decisions.

Thoroughly observing secrecy measures the submarine lurked in the depths... This "battle" went on for a long time. But the ASW men won it anyway. The decisive moment of the torpedo attack arrived. Senior Lieutenant Sivtsov together with his subordinates checked the readiness of the weapon. Upon a command from the bridge a salvo was launched. The submarine's sonarmen detected the noise of the torpedo propellers too late.

The crew of the large ASW ship had assumed the obligation of firing with an "outstanding" grade in honor of the 50th anniversary of the formation of the USSR. The Northern Fleet men kept their word.

* * *

These days both an experienced officer and a young officer taking his first steps in the service are studying with great zeal. For example, Lieutenants A. Brazhnik, V. Zelenskiy, and V. Kashtan have decided in honor of the 50th anniversary of the formation of the USSR to become full-fledged watch officers and to advance their subunits among the leaders. A recent long cruise was a good development school for them. Intense, steady training brought its fruits. All three officers handled their assigned missions. V. Kashtan and V. Zelenskiy distinguished themselves during a firing and A. Brazhnik showed a high level of nautical schooling.

* * *

"Patronage Ties Grow and Strengthen"--this is the name of a new mobile exhibition of the Northern Fleet Museum devoted to the 50th anniversary of Leninist Komsomol's patronage of the Navy.

Here photographs are shown of prominent officers and political workers, famous war heroes who came to the Northern Fleet under sponsorship by Komsomol. Among them are A. Golovko, A. K. Nikolayev, V. Platonov, N. Vinogradov, N. Torik, V. Fokin, I. Kolyshkin, M. Gadzhiyev, and B. Safonov. Photostats of newspapers and other documents tell the story of the manifold forms of patronage ties between Murmansk Komsomol and the Northern Fleet.

Many materials are devoted to the period of the Great Patriotic [52
War. Photographs are present of the submarines LENINSKIY KOMSOMOL and YAROSLAVSKIY KOMSOMOLETS, built with money from Komsomol members and the youth of the country. The documents on the feats of the Komsomol fighting men, their courage and bravery, and their selfless devotion to the Motherland, the Communist Party and to the Soviet people are impressing.

The exhibition showed warships which are worthily continuing the traditions of their predecessors. The entire country knows of the feat of the crew of the nuclear-powered submarine LENINSKIY KOMSOMOL, whose Komsomol organization is recorded in the Roll of Honor of the Komsomol Central Committee. The submarine YAROSLAVSKIY KOMSOMOLETS bears the title of "outstanding ship" for the fifth year.

The crews of the CHELYABINSKIY KOMSOMOLETS and MOSKOVSKOY KOMSOMOLETS are greeting the jubilee of the Komsomol patronage of the Navy with high marks in combat and political training.

The materials on the development of patronage ties between the Northern Fleet and the Komsomol members of Moscow city and Moscow, Murmansk, Chelyabinsk, and other *oblasti* are interesting.

Red Banner Pacific Fleet

CinC of the Pacific Fleet Admiral N. Smirnov awarded government awards to a group of officers--the leaders in the Socialist competition in honor of the 50th anniversary of the formation of the USSR. Among them are Order of the Red Star winners Captains 1st Rank N. Vasechkin, A. Pinchuk, and V. Shavrin. Captain 3rd Rank-Engineer L. Lygin, Captain-Lieutenants N. Boycharov and D. Tuney, Captain V. Maksimenko and others received the "For Combat Services" medal.

* * *

The regular graduation took place at the S. O. Makarov Pacific Ocean Higher Naval School. First Secretary of the Maritime Province *Kray* Party Committee V. Lomakin and Admiral N. Smirnov warmly congratulated the lieutenants and wished them smooth sailing in all latitudes of the World Ocean.

Greetings from USSR Defense Minister, Marshal of the Soviet Union A. A. Grechko, and CinC Navy Admiral of the Fleet of the Soviet Union S. G. Gorshkov were read to the ranks of graduates.

The results of the graduation are gladdening. O. Mitin and S. Doroshenko were graduated from the School with a gold medal. Seventeen men received diplomas with an "outstanding" on them. Almost half of the officers became Communists in the School.

* * *

Colonel of the Medical Service G. Serov has served about 20 years in the Pacific Fleet. Gennadiy Dmitriyevich [Serov] is the author of more than 20 rationalizing proposals which are also used in other fleets.

Recently G. Serov defended his dissertation. Its materials have found widespread application in the health institutions of the Navy and of the Public Health Ministry of the country.

Twice Honored Red Banner Baltic Fleet

In the Liepaya Officers Club a meeting was held between the CinC Navy, Deputy of the Supreme Soviet of the USSR, Admiral of the Fleet of the Soviet Union S. G. Gorshkov and the voters of the Kuldiga voting district. Representatives of the Party, council, social organizations of the city, delegations from enterprises, and collective and state farms and fighting men of the garrison attended it.

In his speech S. G. Gorshkov discussed the question of the international policy of the CPSU and the Soviet government, dwelled in detail on CPSU Central Committee steps toward easing tension, and told about the modern Navy. The CinC Navy assured the voters that the Communist Party will also in the future devote unwavering attention to strengthening the defensive capability of our Motherland.

S. G. Gorshkov visited ships and units of the garrison and met with navymen. He noted with satisfaction the successes which the Baltic Fleet men have achieved in fulfilling Socialist obligations in honor of the 50th anniversary of the formation of the USSR.

* * *

Communist A. Sazonov was elected to the Party Bureau of the subunit for the second time. An outstanding knowledge of his work, Party-mindedness, a man of principle, and a constant desire to know more and to do better are the traits of Captain 3rd Rank-Engineer Sazonov. He is a leader in the Socialist competition in honor of the 50th anniversary of the formation of the Soviet Union and in doing a great deal of work in

mobilizing the fighting men for a worthy welcome for this glorious jubilee.

* * *

It is a busy time on the Fleet airfields. The Baltic Fleet aviators, like all Soviet fighting men, are filled with resolve to mark the 50th anniversary of the formation of the Soviet Union with new successes in improving the combat readiness of the units and subunits. The crews are steadily upgrading their tactical training and persistently studying that which is essential in warfare, primarily how to deliver accurate attacks against the enemy. This kind of skill does not come overnight. It is developed in the process of intense training on the ground and in the air. [54

There are many sharpshooters in the combat employment of weaponry in the Fleet. For example, the crew commanded by N. Modeyev destroyed a target with a direct missile hit.

Red Banner Black Sea Fleet

The Guards large ASW ships KRASNYY KRYM and KRASNYY KAVKAZ and also other ships in company with them returned from a regular cruise in the Atlantic and Mediterranean. The crews carried out their assigned missions fully, and achieved new successes in Socialist competition in honor of the 50th anniversary of the formation of the USSR. The firing exercises of the subordinates of Senior Lieutenants V. Balashov, B. Basistyy, and M. Gladysh were carried out with "outstanding" grades.

* * *

Five years ago the Kiev Higher Naval Political School was opened by resolution of the CPSU Central Committee. In these years it has trained two classes of officer graduates who are standing watch in all of the Fleets. The command and the political organizers of the units and forces note the skill, initiative, and love of work of many of the School's graduates.

Let us present a few examples. Grigoriy Blazhiyevskiy arrived at the School from a submarine. The son of a political worker, he decided to follow his father's path and carried out his cherished dream. In all the years Blazhiyevskiy studied only with "outstanding" grades, and was secretary of the primary Party organization of a subunit. Having received his diploma, the officer assumed the billet of first lieutenant of a ship and successfully handled his duties.

The young political worker V. Laskarev was given an incentive award by the CinC Navy for participating in a search for an "enemy" submarine. Lieutenant V. Oleynikov enjoys a high degree of respect among the crew

of an escort ship which was named among the best in the unit.

Letters are coming in from the Fleets. They contain praise for the graduates of the School and thanks to its collective for training and educating political workers who fervently love their work.

* * *

The Central Committee of the Ukrainian Komsomol awarded the Republic Prize to the Black Sea Fleet Song and Dance Ensemble for their high performance skill, for propaganda on musical culture and choreographic art, and for active work in the patriotic and international education of the fighting men of the Fleet and also of the youth.

The Presidium of the Supreme Soviet of the UkrSSR awarded the honorary rank of Honored Artist of the Republic to A. Vasil'yev and [55
A. Sednev, artists of the Black Sea Fleet Drama Theater, and to E. Kuzh'mo, choir master of the Black Sea Fleet Song and Dance Ensemble.

A package arrived from Bulgaria at the Academician N. I. Pirogov Red Banner Naval Hospital from Honored Doctor of the Bulgarian People's Republic Professor Zdravko Mitsov. It contained a book by Comrade Mitsov entitled "Nikolay Ivanovich Pirogov. His Life and Work." The Professor wrote on the title page: "I present my humble work to the N.I. Pirogov Red Banner Naval Hospital. With deep respect, the author."

In 1927 Mitsov emigrated to the USSR. He worked as a teacher in the Military Medical School. Later he served at Sevastopol. In 1945 Colonel Mitsov returned to Bulgaria.

* * *

A group meeting of writers who write about the sea was held in Odessa. Hero of the Soviet Union K. Badigin headed it. In his opening remarks he noted that literature about the sea plays a great role in shaping the character of a navyman. "We expect from people who write about the sea," said Badigin, "novels, stories, and poems which will capture our youth and aid them in becoming real men."

Those present exchanged work experience, and appeared before the workers of the city with their works.

<u>The Naval Academy</u>

A regular graduation was held at the Naval Academy. First Deputy CinC Navy Fleet Admiral V. Kasatonov warmly congratulated the officers upon the completion of their training and awarded the diplomas.

On behalf of the graduates Captain 2nd Rank V. Beznosov assured the CPSU Central Committee and the Soviet government that they will carry out the tasks assigned to the Navy by the 24th Congress of our Party with honor.

The Military Council of the Navy

In August of this year a group of journalists from the Moscow newspapers, news agencies, radio and television, and several other journalists were received by the Military Council of the Navy. During the meeting Member of the Military Council and Chief of the Political Directorate of the Navy Admiral V. Grishinov told of the combat training of the personnel, and thanked the journalists for the broad coverage of the heroic daily life of the navymen and for propaganda about the modern Navy. The admiral called on the representatives of the press, radio and television not to lose contact with the Fleet and to more vividly show the great patriotic enthusiasm among the men evoked by the preparation for the 50th anniversary of the formation of the USSR.

First Deputy CinC Navy Fleet Admiral V. Kasatonov delivered a speech to those gathered there.

At the conclusion of the meeting an order of the CinC Navy was read concerning the granting of an incentive award to a group of journalists. Many of them were awarded testimonials.

Representatives of the Moscow newspapers, Pravda (T. Gaydar), Izvestiya (V. Gol'tsev), Krasnaya Zvezda (Captain 1st Rank I. Panov), and others attended the meeting.

Photograph caption, p. 51: Captain-Lieutenant D. Lukashchuk is one of the leading political workers of the unit. The political studies group which he leads is the best on the ship.

p. 52: When you return to port after long and intense oceanic training days it is nice to receive an unusual souvenir.

p. 53: A long cruise is ahead. Captain 2nd Rank S. Petrov and Specialist 1st Class, PO 1st Class A. Babkov discuss the tasks of the forthcoming cruise.

p. 54: The Department commanded by Guards Lieutenant V. Ivanov has been declared outstanding for successes in combat and political training. And the officer deserves a great

deal of credit for this. Daily he steadily improves the combat schooling of his subordinates. In the photo: Guards Lieutenant V. Ivanov inspects the equipment of which Guards Seaman A. Petrakov is in charge.

MORSKOY SBORNIK, No. 9, 1972, pp. 58-62.

NAVAL INTELLIGENCE TARGETS AND FORCES

by Doctor of Naval Science Captain 1st Rank K. Titov
(Based on materials from the foreign press)

Naval intelligence has always played a large role in the military [58 intelligence system. Its significance has increased still further with the equipping of the fleets of the main powers with nuclear missile weaponry, which permits not only the destruction of warships at sea and in port, but also the annihilation of the most important strategic objectives deep in enemy territory. Moreover, a trend has been noted in the armed forces of several capitalist countries, and above all in the USA, toward shifting the potential of strategic means of nuclear attack into the depths of the World Ocean.* This has been occasioned by the desire first of all to remove the strategic means of nuclear attack away from monitoring by the enemy and to reduce his capability to oppose the employment of these means, and secondly to divert to the maximum degree from their own territory enemy nuclear attacks designed to knock out the strategic nuclear forces.

Qualitatively new objectives of strategic import have appeared on the expanses of the World Ocean in the last decade. Primarily these are the FBM submarines, which together with their means of support form the strategic nuclear missile submarine weapons system. And the former traditional objectives--submarines, ASW and amphibious forces, and auxiliaries--have also changed. All of this has required the development of naval intelligence forces and means, altering their organizational form and operational methods.

Naval reconnaissance objectives--surface ships and submarines, naval aviation aircraft--are characterized today by great diversity, high maneuverability, combat readiness to employ their weaponry, and their wide dispersal both throughout the area of the World Ocean as well as far from their own shores. Foreign experts usually divide these intelligence targets into the following main groups: strategic nuclear-missile submarine systems, attack carrier forces, ASW forces, landing (amphibious) forces, auxiliary and transport ships, and systems of control, communication, navigation, rear services and other forms of support.

* United News and World Report, Vol. 63, No. 16, 1967, pp. 38-39; Navy Times, Vol. 19, No. 20, p. 5; Armed Forces Management, Vol. 10, No. 8, May 1970.

Strategic underwater nuclear missile systems (e.g., POLARIS-POSEIDON) represent a complex of interdependent elements whose normal functioning ensures a high combat readiness for the system. These elements are: the FBM submarines; command posts and staffs implementing control of these submarines; transmitting and receiving radio centers supporting communications with them; various navigational systems permitting the determination of the coordinates of the submarines and other data essential for launching missiles; bases and mobile logistical means; missile arsenals and test ranges for storing and preparing the missiles; and training centers for training submarine crews. The main intelligence targets of such systems are considered to be the guided missile submarines about two-thirds of which (in the USA for example) are combat ready and are standing combat watch in the ocean (the rest [59 are undergoing overhaul, being refitted, undergoing combat training, etc.*). Since there are similar submarines in the navies of other

* Jane's Fighting Ships, 1970-1971, pp. 387-391; The Underwater Dotter, No. 211, p. 4.

countries, the Americans have special requirements for intelligence concerning underwater nuclear missile weapons systems: it must keep all of the most important elements of these systems under constant surveillance.

Foreign experts consider the special features of the supporting systems (communications, navigation, etc.) as reconnaissance objectives to be their diversity with respect to their spheres of location and activity (at sea, under water, on land, in the air), the global nature of their operations, and the deployment of their elements over the vast space of the world. This has evoked a desire on the part of the command of the aggressive blocs to increase the reliability of the systems through repeated back-up systems.

Attack carrier forces also have their special features as a reconnaissance objective. Whereas reconnaissance for guided missile submarines is made very difficult by secrecy of their navigation, attack carrier forces do not possess this quality. However, foreign military experts believe that carrier groupings are capable of putting up strong resistance against reconnaissance forces and means, creating a deeply echeloned AA and ASW defense around its nucleus. Carrier cruises are made in company with other combatants (frigates, destroyers) armed with AA and ASW missile weapons. The attack carriers are also armed with close-range AA guided missiles.

Under today's conditions the attack carrier screen is circular (up to 6--9 screening ships for each attack carrier). These combatants are deployed in the cruising (combat) formations of attack carrier groups and forces, taking into account the creation of an effective ASW and AA defense. In addition to the aircraft aboard the attack carriers and

and the screening ships, land-based ASW aircraft and carriers of ASW hunter-killer groups (one ASW carrier and 6--8 destroyers) are used to defend the [attack] carriers.

The air defense of a carrier attack force has a zonal character. The detection range of airborne targets at high altitudes reaches several hundred kilometers owing to the extension of long-range radar picket aircraft in dangerous directions. Fighter-interceptors, sea-to-air guided missiles with a slant range of 3 to 185 km and a vertical range of 100 m to 20 km, and also AA guns are used to destroy airborne targets.*

* Jane's Fighting Ships, 1969-1970, pp. 31-33. [Sic]

The carrier attack force ASW defense has a near zone, in which the immediate screening ships operate, and a far zone, in which land-based and carrier ASW aircraft, helicopters, and ships of the hunter-killer group operate. The total depth of the strip of sea monitored by the ASW forces can reach 200 km ahead along the course heading and 150 km abeam of the course the attack carrier force is following.

According to foreign experts, an attack carrier force heavily saturated with air defense and ASW means requires the employment of forces and means having a high combat stability and reliable support for the reconnaissance for these carrier forces.

During WW II attack carrier forces were widely used in combat operations at sea by such giant naval powers as the USA, Japan, and England. The experience of the reconnaissance for these forces has been rather broadly covered in naval historical literature.* After WW II they continued to be considered the main striking force of the navies of the capitalist countries. In the late 1950's and early 1960's in connection with the arming of the carrier aircraft of the US and British navies with nuclear bombs, the attack carriers, together with the strategic bombers, became the main nuclear force of these states.

* See for example S. Roskill, The Fleet and War, Voyenizdat, 1967; I. Korotkin et al. Avianostsy (Aircraft Carriers), Voyenizdat, 1964; F. S. Sherman, American Carriers in the War in the Pacific, Voyenizdat, 1956; The Campaigns of the War in the Pacific, Voyenizdat, 1956, and others.

Despite the intercontinental ballistic missiles and guided-missile submarines, even today aircraft carriers have not lost their importance because they possess great potential capabilities for executing various missions: the destruction of the enemy fleet at sea or in port, supporting [ground] troops, destroying land targets, etc. However, carriers located in their own coastal bases require a great deal of time (6--12 days) to deploy in areas of possible combat employment,

which creates favorable conditions for intelligence about them. Taking this into account, the US military-political leadership constantly keep part of them among the composition of the Sixth and Seventh Fleets in areas of probable and actual combat operations.

ASW forces became a target of naval intelligence a comparatively long time ago--from the moment of the appearance of submarines, i.e., from the beginning of the 20th century. However, their importance as an intelligence target has considerably changed today. This was brought about by the appearance in the last decade of nuclear-powered submarines, which are considered by foreign military experts to be ten times more difficult to seek out and destroy than diesel-electric powered submarines.

* U. S. Naval Institute Proceedings, January 1963, pp. 57-65.

ASW intelligence systems have also become more complex. They have recently been supplemented by long-range submarine sonar detection hydrophone cable systems, deep-water moored buoys with hydrophones, etc.* The USA and the European NATO countries are strongly engaged in

* U. S. Naval Institute Proceedings, February 1969, p. 154; Data, July 1967, "The Navy ASW Program."

the development of these means not only in coastal waters but also in the most important areas of the World Ocean.

As an intelligence target amphibious forces have not basically changed, although they have modern helicopter landing ships in their composition, and also the performance characteristics of the landing ships differ considerably from WW II type craft. The US Navy, for example, is striving to have landing ships with a total carrying capacity of up to two marine divisions and a ship speed of not less than 20 knots. A great deal of attention is being given to the creation of new classes of landing means. In many maritime countries construction has begun on air cushion landing vehicles, and work is being done on surface effect ships. All of this is increasing the mobility of landing forces considerably, and is expanding their combat capabilities.

Such new important targets as nuclear stores supply transports, submarine tenders for guided missile submarine squadrons with spare missiles, transports carrying missiles for submarines, etc., have made their appearance in the forces supporting the combat operations of the fleets of the nuclear powers.* These auxiliaries, actually being mo-

* Jane's Fighting Ships. 1970-1971, p. 387-391.

bile warehouses for missile and nuclear weapons, are of great importance in supporting combat operations at sea.

Changes in the composition of the transport ships of the merchant marines of all states have occurred (and are occurring) in the postwar years: the size and carrying capacities of tankers and containerships have increased sharply, speeds have increased, etc. With respect to the amount of freight carried and its importance, supertankers and containerships are comparable to entire convoys of merchant ships of the WW II years. A great deal of attention is being devoted to reducing the period for loading and unloading ships by containerizing the freight and reducing shipping times by increasing the speeds of transport ships. Containerized shipping has been widely used particularly in delivering American goods to Southeast Asia. According to the foreign press, the [61
Americans employed transport-landing helicopters on a mass scale in the Tonkin Gulf to speed up the unloading of ships when there was a lack of berths.

Taking the changes in intelligence targets into account, foreign experts came to the conclusion that naval intelligence was faced with new highly complex problems occasioning a development of its forces and means and a quest for new forms of organization and methods of conducting it.

Already in WW II intelligence forces and means were highly diverse and numerous. In characterizing the operation of British naval intelligence, the deputy chief of this service in those years, D. Maclaughlin, cited a large number of sources for achieving essential information: radio intercepts, deciphering and reading decoded radiograms of the enemy, documents captured from the enemy under various circumstances (including from sunken ships and aircraft shot down), determining the coordinates of hostile ships finding the direction of their transmissions, air observation and photoreconnaissance, seeking out and observing enemy surface ships, reports of agents and diplomatic representatives in neutral countries, examining letters of the prisoners of war, analyzing the intensity of radio traffic in the enemy navy, and others.*

* D. Maclaughlin. The Secrets of British Intelligence, 1939-1945. Translation from the English. Voyenizdat, 1971, p. 40.

In the postwar years qualitative changes in existing intelligence means took place and new ones appeared. Thus, surface and subsurface combatants of the navies of many of the NATO countries were outfitted with radio, electronic, and other intelligence equipment permitting the detection of enemy ships and aircraft from the operation of their electronic equipment tens and hundreds of kilometers away. Radio and electronic intelligence engaging in the interception and direction finding of various ship and shore electronic emissions underwent furious development.

Radio intelligence plays a special role in combat operations at sea where conditions are more favorable for it as well as for radio communications than in the continental theaters of military operations. The imperialist countries have created a far-flung network of radio intelligence centers both in the continents and on islands in the Atlantic and Pacific Oceans. As early as WW II in the so-called "Battle for the Atlantic," the Americans allegedly succeeded in intercepting and taking direction finding bearings on German submarine radio transmissions simultaneously from 26 radio intelligence centers.*

* Morskoy sbornik, No. 10, 1963, p. 25.

The flight range of reconnaissance aircraft (for example, the ORION aircraft) has been considerably increased--up to 9,000 km--and their time of continuous search for sea targets (especially submarines) has been increased up to eight to 12 hours.* The equipment of reconnaissance aircraft has been vastly upgraded with modern photo-optical

* Jane's Fighting Ships, 1969-1970, Naval Aircraft, p. 16.

and electronic equipment. Shore-based patrol aircraft are equipped with thermal location equipment and sonobuoys and are equipped with automated systems for collecting and processing intelligence data and issuing target data for the weapons employment of other forces against the detected submarines.* In the USA, for example, research is under-

* Airspace International, Jan.-Feb. 1969, pp. 43-47.

way connected with the construction of nuclear-powered aircraft for carrying out reconnaissance for enemy targets on the ocean expanses, and, in particular, for prolonged continuous searching for submarines.

The most recent form of reconnaissance for surface targets abroad, and particularly in the USA, is reconnaissance with the aid of artificial earth satellites. Its indisputable advantage over the all other forms of reconnaissance is the possibility of scanning vast areas of [62
the World Ocean in a short time. The American satellites employ basically the very same target detection and location equipment as reconnaissance aircraft only more advanced equipment. They have, for example, the latest electronic, television, and photo-reconnaissance equipment. In this case the reconnaissance targets are relatively large scale ground and sea surface targets visible from space and possessing radar and photographic contrasting properties. Thus, in pictures taken from satellites, objects the size of an automobile are clearly visible. Operating radar stations serve as sources of reconnaissance data for space electronic intelligence.

Space reconnaissance abroad has already reached a very wide scale: in 1969, the USA, for example, launched about 300 reconnaissance satellites.* The US Department of Defense annually spends 1.5 billion dollars in support of reconnaissance satellite launches and 0.5 billion dollars on the development of new space reconnaissance equipment.**

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* Spy business as usual for US spook fleet. Business Week, No. 2069, 1969, pp. 51-58.

** Our Navy, August 1969, pp. 2-7, 56.

In the imperialist countries a great deal of importance is attached to the development of forces and means of so called active (i.e., intelligence, sabotage) reconnaissance, which played a considerable role in naval combat operations in past wars. This form of reconnaissance includes detachments of "commandoes", special subunits of marines, frogmen, divers and demolition experts. Various floating means are employed to deliver the UDT men to the appointed objectives and for carrying out sabotage: high speed boats, helicopters, and "minisubs." The Italian Navy is devoting the greatest attention to these swimmer delivery vehicles. They are building supersmall (displacements of 10 to 40 tons) submarines of various classes, and high-speed (several kilometers per hour) vehicles capable of individual transportation of frogmen under water for relatively great distances (tens of kilometers).

As is seen from a brief review of the development of foreign naval intelligence forces and means, they are very diverse. However, in order to obtain reliable information foreign experts recommend an integrated employment of the forces and means of different types of intelligence: space and agent, radio, electronic, and air intelligence. The main imperialist powers are conducting this kind of reconnaissance at sea with the employment of submarines, special electronic intelligence gathering ships and aircraft, and ASW reconnaissance and patrol aircraft. The goal of this intelligence activity in the areas of the coast of the USSR and of the other Socialist states is to discover the state of the combat readiness of not only our Navy, but also of groupings of other branches of the armed forces located in littoral areas.

All of this demands an intensive study of the growing modern capabilities of naval intelligence by the officer contingent of our Navy.

MORSKOY SBORNIK, No, 9, 1972, pp. 63-64.

WAYS OF PREVENTING INCIDENTS AT SEA

by Captain 1st Rank V. Serkov

On 25 May of this year the Treaty for the Prevention of Incidents on the High Seas and in the Air Space Above Them signed in Moscow by the governments of the USSR and the USA went into force. 63
It had been worked out in the course of negotiations held in October 1971 in Moscow and in May 1972 in Washington between the USSR delegation, headed by First Deputy CinC of the Navy Fleet Admiral V. Kasatonov, and the US delegation, headed by US Secretary of the Navy J. Warner. What are the basic reasons necessitating the conclusion of such an agreement?

Warships of our Navy are in different areas of the World Ocean to support the state interests of the Soviet Motherland. In the course of these prolonged cruises they inevitably encounter warships of foreign navies including warships of the fleet with the greatest number of ships--the American Navy.

The presence of the only International Regulations for Preventing Collisions at Sea [The Rules of the Road] presently does not eliminate instances, arising during the maneuvering of Soviet and American warships close to one another, of a different type of dangerous situation which is fraught with serious consequences. In connection with this, agreement was reached between the USSR and the USA on a meeting of representatives of both sides to seek ways of preventing incidents at sea. In the course of talks between the delegations, it was affirmed that the strict observance of the generally recognized norms of international law concerning the use of the World Ocean has been and will remain the main point in meetings of warships at sea. In addition, it was acknowledged that some norms for ensuring navigational safety are of a rather general nature, and therefore certain difficulties arise in applying them, and even in the different interpretations by the ship commanding officers of the Rules of the Road (which went into force on 1 September 1965). These Rules are presented in a short and, at first glance, understandable form. However, the application of them in practice has turned out to be difficult without additional commentaries and interpretations contained in judicial decisions of cases of ship collisions. The current Rules of the Road, which are a product of long historic development, are based on three maneuvering principles. Thus, the principle of freedom of maneuver to avert a collision is used when passing in a fog (Rule 16) and when the second part of Rule 21 comes into play. When power-driven ships meet sailing and fishing vessels and when meeting on intersecting courses, the second principle, the freedom of maneuver

of one ship with complete limitation of the action of the second ship, is in force. And finally, when ships meet on opposite courses and when passing in narrows the principle of the strictly regulated turning of both ships to starboard applies.

In our view, the use of different principles in the maneuvering regulations and the absence of a clear-cut boundary of the application of individual rules are the basic reasons that difficulties arise in the application of the Rules of the Road. Moreover, the Rules are couched in imprecise expressions such as "moderate speed," "straight or almost straight," "special circumstances of the particular case," and so forth, which are difficult to relate to quantitative characteristics, the need for which is clear, and which permit subjective interpretations.

Taking the imperfection of the Rules of the Road into account, the Soviet delegation introduced a proposal to examine the question of a standardized interpretation of some of their provisions, including the consideration of possible additional measures with respect [64
to preventing the creation of dangerous situations on the high seas and in the air space above them. In this connection, the main attention was focussed on those proposals concerning the obligations of the parties which would not infringe on the existing navigational regime of warships on the high seas, but at the same time would be directed toward increasing the responsibility of the commanding officers of naval ships to adhere to and skillfully employ the Rules of the Road. Agreement on this question was expressed in Article 2 of the Treaty where it was particularly stressed that the principles recognized by international law are the foundation of freedom of navigation and that the parties will take measures for the strict observance by ship commanding officers of the spirit and letter of the Rules of the Road.

In the development of this basic proposition, Article 3 contains a series of obligatory decisions with respect to the maneuvering of the warships of the parties operating near one another. In particular, it indicates that in all instances the ships must remain at a sufficient distance to avert the risk of a collision. Thus, it is acknowledged that the observation by ships of one side of the activity of the ships of the other side is a legal act. The Treaty devotes special attention to this question. However, in carrying out their missions, the observing ships must show discretion and operate in such a manner as to neither interfere with nor subject to danger those ships which are being observed (Rule 4, Article 3).

When warships are cruising at great distances from their home bases, timely replenishment of stores underway is of important significance. The commanding officers of our ships have acquired a great deal of experience in carrying out this task. Moreover, it should be noted that the process of transferring cargo underway in the ocean

even in good weather is difficult and laborious. Success often depends not only on the efficient and skillful actions of the crews, but also to the same degree on the possibility of maneuvering ships freely. In connection with this, agreement was reached on the obligation of the ship commanding officers to take appropriate measures so that the ships remain at a sufficient distance and do not hamper the maneuvers of those of them who, by the nature of the work they are doing, are unable to stay out of the path of the closing ships (Rule 8, Article 3).

In accordance with the requirements of Rule 5, Article 3 of the Treaty, the warships of the parties, when maneuvering within sight of one another, are obliged to signify their actions and intentions using signals (flag, sound, and light signals) provided for in the Rules of the Road and the International Code of Signals. In addition, the Treaty mentions the possibility of experimentally employing "other mutually agreed upon signals." The fact of the matter is that certain specific tasks of naval ships were not taken into account when compiling the International Code of Signals, and there are not the necessary combinations to designate warship activities. In order to fill this gap, a small table of arbitrary signals was drawn up during the negotiations in accordance with the principles used in compiling the International Code of Signals. In essence, it is supposed to make it easier for the commanding officer of a ship to signal his actions in time and for the CO's of the ships of the other side to understand them.

Agreement was also reached relative to dangerous actions not covered by the Rules of the Road and other international acts. For example, the parties are obliged not to simulate attacks or to swing guns, [missile] launchers, torpedo tubes, and other forms of weaponry in the direction of the warships of the other side, since this is always fraught with consequences right up to the employment of weapons in self-defense. In addition, the throwing of any type of objects in the direction of ships of the other party which are encountered and also the use of searchlights or other powerful means of illumination to illuminate the bridges of warships are acknowledged to be dangerous actions.

The question of the procedure for timely information on the carrying out of activities dangerous to mariners (missile testing, gunnery firing, bombing, submarine exercises, etc.), and also on the broadcasting of announcements on areas which are dangerous for ship navigation and aircraft flights are included among those not regulated by [65 international law. Each country establishes the periods and procedures for such notices to mariners according to its own discretion. As practice has shown, in many cases certain foreign radio stations transmit notices concerning dangerous areas only a few hours prior to the start of the corresponding exercises. This does not eliminate the possibility of warships, auxiliaries, and aircraft of the other

side being located there, which in a certain situation could threaten navigational and air safety. Based on the proposal of the Soviet delegation, the Treaty includes a provision obliging both parties to provide a broadcast of notices and warnings to mariners through an established system of radio communications (Rule 1, Article (on operations on the high seas which represent a danger to mariners or to aircraft flights.

In the negotiations a great deal of attention was given to mutual relations on the high seas between military aircraft and between aircraft and warships. The complexity of the review of these questions lies in the fact that there is presently no generally accepted international document on ensuring aviation flight safety similar to the Rules of the Road. In this case, the delegations were guided basically by Article 2 of the Convention on the High Seas of 1958, particularly the concept of freedom of flight over the high seas, wisely taking into account in this connection the interests of other states. Therefore, while enjoying complete immunity, military aircraft over the high seas are obliged to adhere to flight safety rules, not committing dangerous maneuvers affecting the aircraft, warships, and auxiliaries of other states.

The delegations acknowledged that both warships and aircraft of the fleets of the parties do not have the right to display threat or force in relations with each other. They must operate only within the framework of the same freedom of the high seas for all states. Special attention was paid to the inadmissability of the dangerous approach of aircraft flights to the area where combatants and auxiliaries are located.

As the Soviet delegation repeatedly pointed out, modern aircraft are equipped with powerful means for making observations which permit the recognition of aircraft and ships of the other side tens of kilometers away. Due to the fact that the approach of aircraft to within several meters of one another and also to low altitudes and short ranges from warships is not evoked by necessity, they can create dangerous situations and consequently must qualify as illegal actions.

As a result of the achieved agreement, the Treaty includes a provision according to which the aircraft crew commanders of both parties must display the greatest caution and sense when approaching aircraft and ships of the other side operating on the high seas. Moreover, in the interests of mutual safety, the aircraft crew commanders must not make simulated attacks on other aircraft and any warships, and also must also not release various objects near them in such a way as to represent a danger to the ship or to interfere with navigation (Article 4).

As we see, the Treaty contains a series of directives which must be carried out by naval ship and aircraft commanders aiding the prevention of incidents on the high seas and in the air space above them. At the same time, this Treaty, like the Rules of the Road, lacks concrete values for distances ensuring the safe separation of ships meeting, and only the requirement "to stay at a sufficient distance to avert the risk of a collision" is contained in it. When choosing such a distance, the ship's CO again must rely only on many years of experience in applying the Rules of the Road.

Thus, the diameter of their turning circle is pointed to in a series of commentaries on the Rules of the Road as the criterion determining the closest permissible approach distance for ships. Taking the large turning circle of modern warships into account and also the possibility of the occurrence of a rudder failure or a false shift of the rudder by the other ship, etc., it is recommended that meeting [66
ships not be approached closer than three miles. Closing to a lesser distance, when navigating in areas where it is not difficult to maneuver, is considered an action not corresponding to "good" or "normal nautical practice."*

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* Ye. A. Mikulinskiy. Preduprezhdeniye stolknoveniya sudov v more (The Prevention of Ship Collisions at Sea), izd-vo Transport, 1971, p. 37.

It is quite evident that the Treaty would more fully serve its purpose if it contained fixed maximal permissible distances for the approach of ships and aircraft. This is one of the main criteria with which one would have been able to analyze concretely how the parties carry out the provisions of the given Treaty. Therefore the Commission appointed by the parties in accordance with Article 10 will have to develop practical recommendations relative to concrete fixed distances which must be observed when approaching warships and aircraft.

Thus, the Treaty is intended to reduce the possibility of dangerous incidents in situations when the warships and aircraft of the USSR and the USA are operating in direct proximity to one another. In addition, it is essential to keep in mind that sometimes due to faulty observations, the inexperience of commanding officers, rudder casualties, and other reasons, conditions for a dangerous maneuver can be created. Therefore, the presence of the Treaty must not give rise to complacency in naval ship and aircraft commanders. They must always maintain a high degree of observation vigilance to eliminate instances of dangerous maneuvers.

MORSKOY SBORNIK, No. 9, 1972, pp. 77-79.

DETERMINATION OF DISTANCE TO TARGET VESSEL

by Rear Admiral A. Motrokhov

Knowing the distance to a target vessel is a very important element in assessing a situation. However, if it is impossible to measure the distance directly with instruments, indirect methods may be employed. There are several methods for resolving this problem but they all involve complicated and very precise maneuvering.

The most acceptable of these is the "fictitious bearing" method proposed by N. Smirnov.*

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* Osnovy Manevrirovaniya Korablya (Principles of Ship Maneuveri . edited by M. Skvortsova, Voyenizdat, 1966, p. 123.

The essence of this method can be grasped from figure 1 and requires no explanation. However, it has the following disadvantages: while determining the target's components of motion it is necessary to alter one's own course three times and change speed once or twice; the distance to the target is obtained only after its course has been determined; the time required to determine the components of motion of the target of maneuver from first sighting is unjustifiably great.

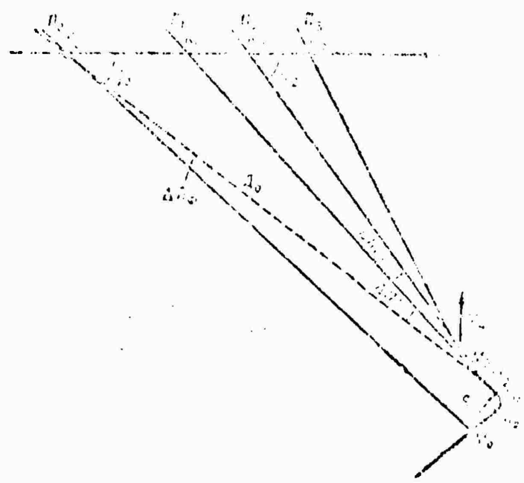

Figure 1: The "Fictitious Bearing" Method.

A somewhat improved version of the "fictitious bearing" method is presented in the following.

During the course of determining the elements of movement the maneuvering is simpler because fewer changes are required in the course of the maneuvering vessel, and no change in speed is needed. Secondly, the distance to the target vessel is computed by a simplified formula before its course has been determined. The principle of the "fictitious increment in bearing angle" or the "$\Delta\Pi_{\phi}$" method boils down to the following (see figure 2). Careful calculations are maintained of the target vessel as soon as it has been sighted on a relative bearing angle [78
of Π_0 and the exact times of bearings taken are recorded.

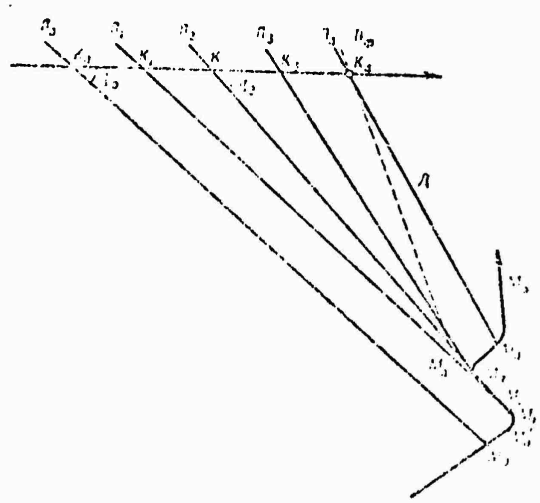

Figure 2: Method of determining distances by the "$\Delta\Pi_{\phi}$" method.

After the maneuvering vessel changes to a course equal to the bearing, there is a change in the bearing to the target, while sailing from point M_1 to M_2 (time $t_{1,2}$) by the amount

$$\Delta\Pi_{1,2} = \Pi_2 - \Pi_1. \qquad (1)$$

Knowing the time from the moment of detection of the target (Point M_0) to the moment the bearing Π is obtained, i.e., $t_{0,1}$, we can compute the change in bearing $\Delta\Pi'$ corresponding to this time interval or

$$\Delta\Pi' = \Delta\Pi_{1,2}\frac{t_{0,1}}{t_{1,2}}. \qquad (2)$$

Equation (2) is valid provided the relative bearing of the target vessel does not change substantially during the time of observation ($t_{0,2}$). This change in the relative bearing should not, as a rule, exceed five or six degrees.

Knowing $\Delta \Pi_{1,2}$ and having determined $\Delta \Pi'$, it is possible to find the value $\Delta \Pi_\phi$ or the fictitious increment in the bearing angle

$$\Delta \dot{\Pi}_\phi = \Delta \Pi' - \Delta \Pi_{0,1}, \quad (3).$$

in which $\Delta \Pi_{0,1} = \Pi_1 - \Pi_0.$

The distance to the target vessel can then be computed by slide rule in accordance with the following simple elementary formula

$$Д_0 = \frac{S_м}{\Delta \Pi_\phi}, \quad (4)$$

or

$$Д_{каб} = \frac{S_{м(кат)} \cdot 57{,}3}{\Delta \Pi^\circ_\phi}. \quad (5)$$

An experienced navigator requires no more than a minute for the computations. During that time the maneuvering vessel will move to point M_3 from which the target vessel will be observed on a bearing of Π_3.

Knowing the distance to the target it is also possible to determine its course from the three bearings (Π_1, Π_2, Π_3). The time required to find the components of motion in this case is reduced by five to seven minutes compared with the method proposed by N. Smirnov.

In addition, in the "fictitious bearing" method systematic errors along with random errors in bearing determination affect accuracy in finding the distance to the target vessel.

In the method proposed herein all values used in formulas (1) through (5) are free of systematic errors, and, consequently, the distances obtained are more accurate. Accuracy is also insured by the fact that errors inherent in graphical construction are not included in the result.

In order to reduce the effect of random errors in taking bearings. it is desirable, upon sighting the target, to maintain a graphical record of the bearings taken, jotting the values down every 15 to 20 seconds. A smooth curve is then drawn through the bearing points plotted (figure 3); differences in bearings of $\Delta \Pi_{1,2}$ and $\Delta \Pi_{2,3}$ for selected times are taken from a mean curve.

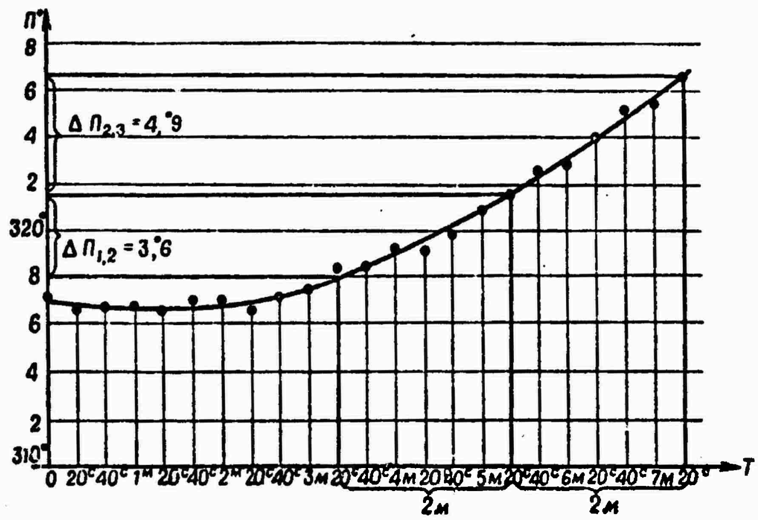

Figure 3: Plot of bearings.

Experience shows that a bearing taken from a curve is two or three times as accurate as one that is derived by measurement. This means that if the random error in measuring a bearing is +0°.5 the graph makes it possible to reduce the bearing error to 0°.15 - 0°.20. When bearing angles $\Delta \Pi_{1,2}$ and $\Delta \Pi_{2,3}$ measure not over 3-4° the distance is determined with a relative error not in excess of 10% and the error in course is not over ten degrees.

The graph of bearings can also be employed to determine the time, direction, and the approximate amount of turn of the target vessel. [79

In those cases there the relative bearing of the target vessel is small (from 10 to 15 degrees), the procedure followed in determining the distance is the same as previously described, but the course is equal to the reciprocal of the bearing.

MORSKOY SBORNIK, No. 9, 1972, pp. 86-91.

FUEL-CELL POWER PLANTS

by Candidate of Technical Sciences V. Volod'kovskiy
(Based on materials in the Soviet and foreign press)

In recent years, many countries (the U.S.A., Great Britain, France, West Germany, Japan, and Sweden) have been carrying on intensive work in producing power plants using the direct conversion of various forms of energy into electrical energy; this includes the conversion of chemical energy into electrical energy through the use of fuel cells, sometimes called electrochemical generators. Because of their performance characteristics, fuel-cell power plants are considered highly promising, and will find broad application. [86

Just what is a fuel cell, and what are its advantages?

A fuel cell is a unique generating device in which the chemical energy of a fuel is converted directly into electrical energy. There are many types of fuel cells, which differ in terms of the type and state of aggregation of the fuel, oxidizer, electrolyte, their mutual arrangement, the electrode material, operating temperature, design use, etc. The many types of fuel cells reflect the great scientific and practical interest shown in them by scientists and designers and the attempts to find the optimal version. The ones which have been the most studied and perfected, and which have found practical application are the low-temperature* hydrogen-oxygen fuel cells, whose design and operating principles will be examined below.

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* On the basis of their operating temperature, fuel cells are divided into low-temperature (below 100° C), moderate-temperature (100--300° C), and high-temperature (300--1000° C).

The hydrogen-oxygen fuel cell (figure 1) consists basically of a casing containing two porous electrodes 2 and 3 separated by a layer of electrolyte 4. In the casing there is an opening for fuel supply 5 (hydrogen gas), the oxidizer 6 (oxygen gas), and the removal of reaction products 7 (water). The electrodes are manufactured of porous materials (sponge nickel, metal-ceramics, activated carbon, etc.). To boost electrode activity, they are coated with a thin layer of catalyst such as platinum or palladium. The electrolyte in fuel cells fulfills the function of an ion-exchange medium and therefore must possess a high ion conductivity and must not allow the passage of electrons. Aqueous solutions of a specific concentration of an alkali such as a 30--80% solution of potassium hydroxide are often used as the electrolyte. Ion-exchange membranes--solid electrolytes in the form of thin plates based on special polymers (resins)--have recently found broad application. Their major advantages are: their

nonspillable quality, their compactness, high ion conductivity, impermeability to liquids and gases, and their capability of achieving almost complete utilization of the fuel.

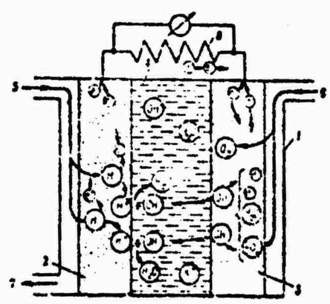

Figure 1: Line drawing of the construction and operation of a hydrogen-oxygen fuel cell:

1 - casing; 5 - fuel supply;
2 - anode; 6 - oxidizer supply;
3 - cathode; 7 - water removal;
4 - electrolyte; 8 - external load.

The principle of the operation of fuel cells can be described as follows. Hydrogen gas is continuously fed to the negative electrode--the anode. The hydrogen molecules, passing through the pores of the anode, disintegrate into atoms due to adsorption on its surface; at the electrolyte boundary, these atoms in turn are ionized, with the formation of free, powerful electrons: [87

$$H_2 \rightarrow H + H \rightarrow 2H^+ + 2e^-.$$

The positive ions H^+ are distributed at the anode--electrolyte boundary, while the free electrons are directed from the anode along a conductor to an external circuit, perform useful work at load 8, lose part of their energy, and return to the positive electrode--the cathode. Here, the slowed electrons are combined with the incoming oxygen atoms, which, interacting with the water molecules from the electrolyte, form negatively charged ions within the makeup of the OH^- radicals.

$$2e^- + \frac{1}{2} O_2 + H_2O \rightarrow 2OH^-.$$

The negative OH^- radicals are displaced through the electrolyte to the anode. Encountering the positive hydrogen ions H^+ on the anode surface, they enter into a reaction with them, with the formation of the final product--water:

$$2OH^- + 2H^+ \rightarrow 2H_2O.$$

Generation of electrical current of given parameters demands that a rigorously specified concentration of electrolyte be maintained in the fuel cell; therefore, the excess water is fed off into a special reservoir.

Thus, the functioning of fuel cells consists basically of the two following processes: ion exchange within the fuel cell (in the electrolyte) and electron exchange in the external circuit. This is the basic difference between fuel cells and conventional devices for igniting a chemical fuel with the liberation of only thermal energy.

Fuel cells have features which are of interest in terms of their practical aspects. Thus, limitations of the Carnot cycle do not extend to the efficiency of their operation, and therefore potentially fuel cells may have an efficiency close to 100%. However, their actual efficiency is always less than 100%, because no matter how perfect the fuel cell may be, it is nevertheless impossible to convert the chemical energy of a fuel completely into electrical energy. Part of it is necessarily lost in the form of irradiated heat, whereby with an increase in the current, heat losses increase as well, and the efficiency decreases. Figure 2 shows the electrical power of a one-kilowatt module of a hydrogen-oxygen fuel cell as a function of the elec- [88 trolyte temperature. It can be seen that with a 20--30° C change in the temperature of the electrolyte, the module power changes by more than a factor of two, and at relatively low temperatures the fuel cell will function at a practically zero power. To eliminate this, a special monitoring and temperature-control system is provided in fuel cell power sources. An important feature of fuel cells in terms of their use is the fact that their efficiency depends little on changes in the external load. Calculations have shown that if the efficiency is 0.9 while idling, at full load it drops to 0.75, i.e., a total drop of 17%. In other words, the fuel cell is quite economical throughout the range of powers. Fuel cells are distinguished by their increased sensitivity to the slightest contamination of the fuel and oxidizer. Figure 3 shows the volt-ampere characteristics of the fuel-cell system on the American Apollo spacecraft as a function of the purity of the oxidizer (O_2). It can be seen that when the degree of purity of the oxygen drops by a total of 0.007%, power drops by 15--20%. This presents great demands on the purity of the reagents for the fuel cell which, of course, is reflected in the cost of producing and using the power plants. The fuel and oxidizer are contained in special tanks. The fuel can be stored either in the form of pure hydrogen in a gaseous

state (in which case it is stored in compressed-gas cylinders), in a low-temperature state (with cryogenic storage), or in a combined form as one of the components of hydrogen-containing chemical compounds (alcohol, hydrazine, ammonia, methanol, etc.). In the last case, to obtain pure hydrogen from the initial product, a special generator/reformer plant is required. Methods of storing the oxygen are the same.

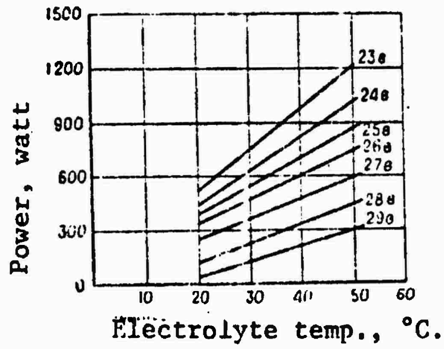

Figure 2: Graph showing the power of hydrogen-oxygen fuel cell module as a function of the electrolyte temperature under various voltage conditions.

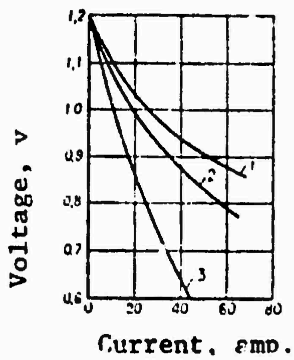

Figure 3: Voltage of a hydrogen-oxygen fuel cell as a function of the discharge current for various oxygen purities:

1:- degree of purity - 99.995%; 2: degree of purity - 99.988%; 3: before purifying.

During the operation of a hydrogen-oxygen fuel cell, water forms (0.9 kg of water per kilowatt hour of electrical energy generated). For example, a fuel-cell power plant with a power of 200 kwt daily accumulates over 4 T of water, and in a month its supply reaches about 130 T. According to foreign specialists, this water can be used for the crew's sanitary and hygienic needs, including drinking, as well as for servicing various ship-board systems.

The electrical power of a fuel cell is determined by the reaction rate on the electrodes. Therefore, attempts are being made to accelerate the reactions. One such acceleration method is increasing the active surface of the electrodes, particularly through the use of porous materials. Technically, it is quite difficult to produce such electrodes, if you also take into consideration the fact that they must have a specific lifespan. At present, electrodes have a limited lifespan, and often determine the lifespan of the fuel cell's functioning, which at present has been extended to almost 1000 hours. In the future it is hoped that it will be increased to 2000--3000 hours and higher.

With respect to structure and principle of operation, the fuel cell is a static system, without any moving parts or components. Therefore, it is with good reason that some specialists hope that fuel-cell power plants will have increased reliability and, what is particularly important, will operate noiselessly.

The fuel cell is a low-power, low-voltage d-c power source. To obtain high electrical power and operating voltage from series-connected individual fuel cells, modules are assembled from which fuel batteries are put together by connecting them in parallel-series, as is done in making batteries from normal chemical storage batteries. In terms of its specific power characteristics, the fuel cell already substantially surpasses other comparable types of current sources, falling behind them only in the cost of the energy generated. However, in the foreign technical press, serious drawbacks have been noted in fuel cells which have already been developed: limited lifespan, high cost of fuel (particularly catalysts), great sensitivity to contamination of the fuel and the oxidizer as well as to temperature changes, the difficulty and high cost of prolonged storage of fuel and oxidizer reserves, the technical complexity of producing the long-life, highly-active electrodes, the need to continuously remove the reaction products, the possiblity of forming highly-inflammable mixtures, the need for a special generator--a reformer plant to obtain hydrogen from the hydrogen-containing chemical compounds.

The great many investigations performed by foreign specialists [89
admittedly show that all difficulties connected with eliminating the basic drawbacks of fuel cells are in principle solved, and they are presently hard at work searching for the actual engineering methods of further improving the fuel cell and bringing it up to an industrial level.

In recent years, many foreign firms and scientific institutions have developed a broad front of work on the creation and production of industrial versions of fuel cells with the most varied purposes. In the U.S.A. alone, more than 175 scientific institutions are at work on developing fuel cells, and spend up to 60 million dollars on this yearly. Fuel cells for space-flight purposes are being worked on most intensely. As early as August 1965, they had found practical application as onboard power sources in the American GEMINI V spacecraft (their maximum power was up to 2 kwt; and their efficiency was up to 50%; power-supply weight 250 kg; specific weight, 27.1 kg/kwt; period of continuous operation, up to 14 days). With respect to marine fuel-cell power plants, judging from foreign materials, work on their production is being carried out more slowly, and at the present they have not gone beyond the stage of design studies and experiments. Test results show that marine fuel-cell power plants are most expedient in those cases when power is required within the range from units to hundreds of kilowatts, and the self-contained on-board electrical-energy reserve within the range from 1000 to 1 million kwt/hr. For lower power reserves, storage batteries are more useful, and for higher reserves, nuclear power plants are more useful. On the basis of such estimates, it is anticipated that the fuel cell may find practical application at sea primarily in lighthouses, in buoys, in underwater laboratories, in early-warning and communication systems, as well as on submarines and surface ships, and particularly in deep-diving vehicles.

The Americans, for example, expect to use fuel cells not only to sharply increase the underwater endurance of deep-diving submersibles, but at the same time to solve such a crucial and difficult problem as supplying the necessary buoyancy to deep-diving submersibles when they lack sufficient weight and space. They also hope to succeed in using fuel cells to increase the duration of continuous submerged cruising of diesel-electric submarines by a factor of approximately ten. It is difficult to say the extent to which this optimism in evaluating fuel cells is justified in practice, but nevertheless work continues quite intensely on producing marine fuel-cell power sources.

It is not out of the question that in the near future the first marine fuel-cell power sources might appear in experimental use. For example, the opinion has been expressed that in 1975 there might be a marine fuel-cell power source with a power exceeding 100 kwt with an efficiency up to 70%, a specific weight of 27--36 kg/kwt, and a one-year life service.

In the U.S.A., a design has been developed for a 40--50 kwt fuel-cell power source with an electrical-energy reserve of 1100 kwt-hr, which is planned for installation in the Deep-Submergence Search Vehicle, having a weight of 31.7 T in air and a submergence depth of 6100 m. Such a power source will permit the vehicle to achieve a [90
maximum speed of up to 5 knots, while at a cruising speed of 3 knots it will cruise continuously for 30 hours. The size and weight of power plants using fuel cells will be one half that of power plants

using silver-zinc batteries and having the same power (4.8--5.0 T and 9.5--11.3 T, 3.4--3.7 m^3 and 5.6--6.4 m^3, respectively). The Argonaut program proposes the creation of a special nuclear-powered submarine for simultaneously servicing two DSSV vehicles while submerged; this includes replenishing them with fuel and oxidizer reserves for the fuel cells, which are supposed to be generated from sea water through the use of a reformer plant installed on the submarine for this purpose.

Figure 4 shows a line drawing of one possible version of a fuel-cell power plant for a submarine or deep-diving vehicle.

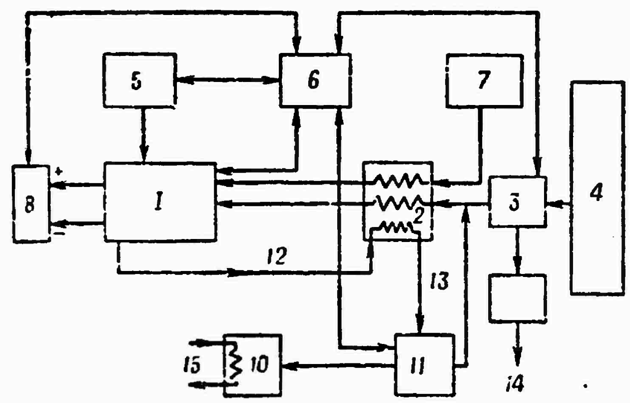

Figure 4: Line drawing of power source with hydrogen-oxygen fuel cells:

1 - fuel cell; 2 - reagent preheating; 3 - hydrogen generator; 4 - fuel reserve; 5 - fuel-cell preheating during start-up; 6 - automatic control, monitoring, and shielding of the source; 7 - oxidizer reserve; 8 - external load; 9 - fuel-breakdown products; 10 - water cooler; 11 - condenser-separator; 12 - mixture of hydrogen with water vapor; 13 - dry hydrogen; 14 - by-product discharge overboard; 15 - sea water.

The Swedish firm ASEA is developing, specifically for submarines, a power plant with hydrogen-oxygen fuel cells which will have a power of 200 kwt and an efficiency of 45%. According to company experts, such a power plant will permit a submarine to cruise submerged continuously for one month. Fuel cell operational periods of 2000 hours when the temperature is lowered to 50° C are guaranteed. Two versions of fuel reserve storage are anticipated: either in the form of pure liquid hydrogen (the Hydrox system) or in the form of ammonia (the Amox system).

A reformer plant is proposed for use in separating the hydrogen from the ammonia. Construction of a submarine using fuel cells was planned in 1970.

The French firm Alsthom has developed and tested a hydrogen-oxygen fuel cell having so-called filter-press construction, which is quite promising for use at sea. In this fuel cell, a mixture of liquid electrolyte (KOH) with the fuel (hydrazine hydroxide) circulates through a "cellular" anode with a length of several centimeters, separated from the cathode by an ion-exchange membrane. The manner in which the mixtures flow and the microstructure of the electrodes are selected such that each time the mixtures flow through the fuel cell, as much as 90% of the fuel and oxidizer manage to react, so that a practically pure electrolyte leaves the fuel cell. New portions of fuel and oxidizer are fed into it, and these mixtures again enter the fuel cell. A small-size module of such fuel cells with 2 kwt of power has been produced and tested. Tests have shown that with normal efficiency, the 45% specific energy of the modulus reaches 850 kwt-hr/kg, power density 1000 kwt/m^3 and specific weight 3--5 kg/kwt, i.e., in terms of power density this module surpasses all other known types of fuel cell, as well as silver-zinc batteries by a factor of 7--8, and lead-acid batteries by a factor of 15--20.

In addition to hydrogen-oxygen fuel cells, air fuel cells are being produced which for their oxidizer use the oxygen from atmospheric air and which therefore need no on-board oxidizer reserve. Air is taken from the atmosphere by a heater and fed to a compressor, where it is compressed to boost the concentration of oxygen per unit volume. The compressed air is purified of carbon dioxide in a gas scrubber, [91
heated, and fed to the fuel cell, where the oxygen oxidizes the fuel. An air fuel-cell power plant requires constant connection with the atmosphere, and therefore is not completely self-contained. Nevertheless, they are considered promising for practical use in buoys, lighthouses, means of communication, on small craft, and shore-based sites. Many foreign scientific institutions and industrial firms are busy developing air fuel cells. Thus, the American firm Monsanto Research Company has built, for transport purposes, a demonstration power plant using air hydrazine fuel cells with a power of 20 kwt (4 modules of 5 kwt) with a current intensity of 180 amps and 112-volt voltage. The weight of one module is 238 kg, and the dimensions are 229x229x636 mm. It must be remembered that hydrazine, while being an excellent fuel, is at the same time toxic and explosive, and furthermore its cost is high ($2.10 per liter). Therefore, ways are being sought to use cheap types of normal hydrocarbon fuels such as natural gas, crude oil, or gasoline, etc., in fuel cells (figure 5).

Other types of fuel cells are in developmental stages or undergoing testing: amalgam-oxygen, alcohol-oxygen, those based on molten carbonates, and others. Particular attention should be paid to investigations aimed at developing regenerative fuel cells (redox ele-

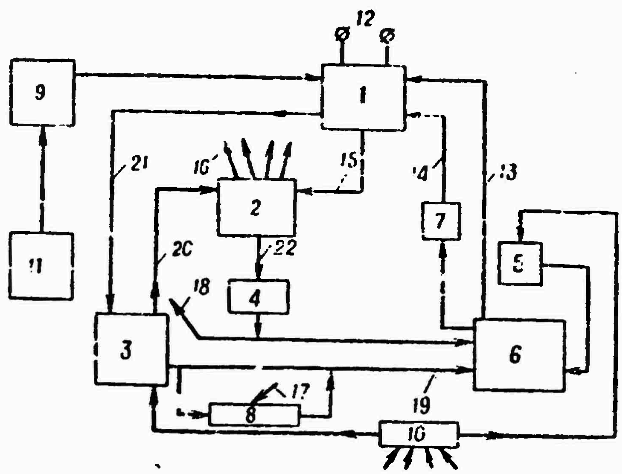

Figure 5: Line drawing of a power source using hydrocarbon-air fuel cells:

1 - fuel cell; 2 - condenser; 3 - evaporator; 4 - water container; 5 - compressor; 6 - gas scrubber; 7 - electrolyte cooler; 8 - electrolyte preheating during start-up; 9 - hydrogen generator; 10 - air supply from atmosphere; 11 - fuel reserve; 12 - load current; 13 - air to fuel cell; 14 - electrolyte to fuel cell; 15 - liquid heated air from fuel cell; 16 - dry air to atmosphere; 17 - fuel for preheating of electrolyte; 18 - water to hydrogen generator; 19 - electrolyte to gas-scrubber preheat; 20-moist air; 21 - electrolyte with excess water; 22 - water from condenser.

ments), in which attempts are being made to implement the idea of regenerating the final reaction products with the formation of the fuel and oxidizer and thereby eliminate the necessity of "transporting" large fuel and oxidizer reserves. Preliminary investigations have emphasized the feasibility of this concept. By the energy of the external source (chemical, thermal, nuclear, or other) the final reaction product such as water can be used to regenerate the fuel and oxidizer, which are returned to the fuel cell and there are again used for their own purposes. This closed cycle of "final product--regenerator--active fuel-cell materials--final product" can be repeated numerous times without the use of energy from an external source. To judge from the information in the foreign press, work on developing redox-elements is only now getting under way, and is of a purely investigative nature. Nevertheless, they are of great practical interest. A general and persistent search is going on to find the fuel cells which are the most economical, simple and reliable during use, and which have high characteristics and long service life.

This brief survey of the state of investigations in the field of fuel cells abroad shows that some progress has been made in this new field of power engineering.

However, it must be kept in mind that often the reports of a company concerning their work and achievements are of an advertising nature, and that the desired must be distinguished from the actual.

MORSKOY SBORNIK, No. 9, 1972, pp. 110-111.

A USEFUL PUBLICATION

by Candidate of Naval Sciences,
Captain 2nd Rank I. Yegorov,
Red Banner Northern Fleet

The scientific-technical revolution which is taking place in military affairs is accompanied by a transition from separate automatic devices and assemblies to complex automated control systems. This increases the effectiveness of military work, since it frees the operators from many laborious functions, saves time, and increases the accuracy and volume of processed information. However, it is practically impossible to completely transfer the functions of an operator to automatic control machines. The operator has to solve numerous problems in the receipt of information, its analysis, and relay and in the operation control of the apparatus in relatively brief periods for long stretches of time. [110

Experience in operating automated control systems shows that under certain conditions the operator can be the weakest link in the system, since the demands placed on him often surpass the psycho-physiological resources of man in general, and of the given subject in particular. At the present time, the efforts of many prominent scholars are being devoted to development recommendations on calculation of the psycho-physiological characteristics of the operator in the design, construction and operation of automated control systems of various types. One of the publications on this subject which is of great interest to fleet specialists of the electronics department is the monograph by Doctor of Technical Sciences G. Popov, "Human Engineering in Radar.*

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* G. P. Popov. Inzhenernaya psikhologiya v radiolokatsiya. (Sistema indikator-operator). Izd-vo Sovetskoye radio, 1971, 144 pages. 11,000 copies printed.

For a long time fleet specialists have been concerned with detecting targets, and its component--the optimal receipt of useful information from the indicator screens of electronic systems. This is one of the most complex problems in the observation process. The combat readiness and combat-fitness of ships and units largely depends upon how this is resolved.

The author succeeded in developing a general method of evaluation of the combat effectiveness of radar systems, taking into account their technical characteristics and the psycho-physiological

characteristics of the operators. He disclosed the potentialities of each element of the detection system and drew practical conclusions concerning the search for suitable and reliable forms of communication in the indicator-operator link.

The method of statistical analysis of the process of signal detection serves as the basis for research on the problem of synchronizing radar indicators and data representation systems with the efficiency of the operator. This method has enabled us, without complex mathematical calculations, to obtain a series of major relationships, including the dependence of probability of detection and the probability of false alarm on the operating mode of a cathode ray tube and on the threshold of contrast sensitivity of the visual analyzer.

An equally significant result of research on a detection system was the creation of a graphic method of determination of the optimal (in terms of contrast) operating mode of the cathode ray tube of the indicator and calculation of the characteristics of the detection, sufficiently simple and available to fleet specialists. We shall employ the given method if the modulation characteristics of the cathode ray tube and the threshold values of the contrast sensitivity of the visual analyzer of the operator are known. It is possible to calculate both missing parameters in advance using the method also proposed by the author.

Thus the value of the book is that it has a practical aspect. Many conclusions concerning the organization of the functional activity of the operator and the choice of operating modes of techni [111
cal equipment are already beginning to be used in the practical work of shipboard specialists. In particular, the results of research on the visual analyzer, taking into account ways of improving efficiency, have enabled us, in individual cases, to re-examine the preparation of operators to stand watch.

The best mode of transmission of information in the indicator-operator link, as has been established, is provided in the basic selection of brightness of the scanning line of the indicator screen, of the sources of illumination of a space, of the spectral radiation characteristics of the bulbs, and the selective properties of the light filters. However, even observing these conditions, the operator will get tired and will permit errors, since many different factors not subject to quantitative analysis affect his efficiency. Therefore, it is necessary to continuously monitor the efficiency of the operator. Unfortunately, this was not reflected in the book under review. Nevertheless, this observation cannot alter the good impression from a useful and interesting book.